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The Locomotive Link Motion—V.

BY F. A. HALSEY.

As locomotives are built, there are three sources of error which tend to make cut-off, release and compression occur at different points in the stroke for the two ends of the cylinder. These sources of error, in the order of their importance are, the offset of the eccentric rod pins back of the link arc, the angular vibration of the eccentric rods and the angular vibration of the connecting rod. To a certain extent the latter two compensate the first, but not entirely, and to complete the compensation the hanger stud is set back of the link arc. So far as I am aware, the importance of the first two sources of error has not before been recognized.

All previous discussions of the link motion with which I am acquainted, proceed upon the assumption that the hanger stud is adjusted to correct the irregularities due to the connecting rod, although, in point of fact, the adjustment made is the direct opposite of what would be required if this were its purpose.

If a link motion be laid down with the Scotch yoke connection between the piston rod and crank pin, which obviates the error due to the connecting rod, the offset of the saddle pin necessary to obtain an equalized cut-off will be found to be greater than if the connecting rod be introduced, and if a connecting rod be shortened, this offset will be found to diminish with each shortening of the rod until, at some very short length, the stud will be placed over the link arc* In other words, the connecting rod, instead of being a disturbing factor, as has heretofore been taught, is in reality a corrective factor, since it, to a certain extent, corrects other errors, and in so far as it corrects these errors it reduces the offset of the saddle stud, the remaining offset being for the purpose of correcting the residual error due to the offset eccentric rod pins.

Before taking up the study of these errors in detail, it is advisable to examine the movement as a whole, in order to understand the means at command for accomplishing the required purpose. In this connection one fundamental fact should be kept in mind, namely, when the valve admits or shuts off steam it is displaced from its middle position by an amount equal to its lap. This will be apparent from Fig. 14, which is a cross section of such a valve located centrally with the valve seat. It will be seen that both ports are covered on the outside by the lap, and that to move the valve to the admission or cut-off position for the right-hand port involves a movement to the left equal to the lap, while to move it to the admission or cut-off position for the left-hand port, involves a similar movement to the right, and in all cases cut-off takes place with the center of the valve approaching the center of the seat.

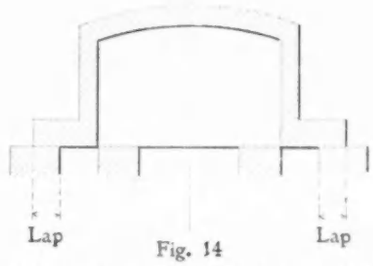

Fig. 14

SLIDE VALVE SHOWING EFFECT OF LAP.

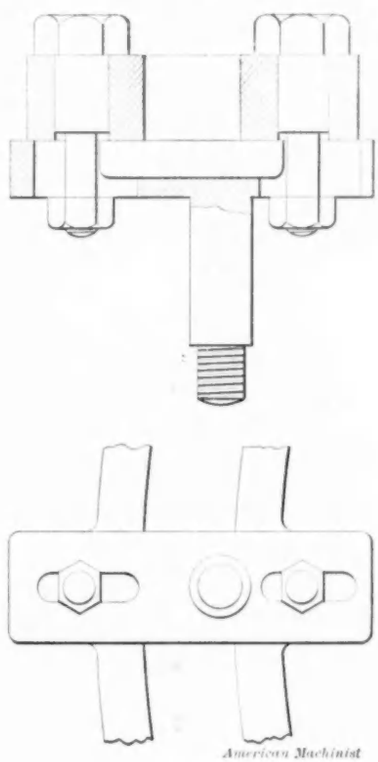

Fig. 15

ADJUSTABLE HANGER STUD.

THE ADJUSTMENT OF THE SADDLE STUD.

The adjustment of the residual error is accomplished by so suspending the link that it rises and falls in the course of its movement, in consequence of which the point acting upon the link block at cut-off in the rearward stroke is different from that acting in the forward stroke. Points of the link near the center give earlier cut-offs than those removed from the center, and it is obvious that by so suspending the link that the point acting upon the link block is different for the two strokes, the two points of cut-off may be altered as desired.

There are two methods by which this movement of the link can be accomplished. One, which is in universal use, consists of placing the saddle stud back of the link arc, the effect being obviously to cause the arc to rise and fall during its oscillation. The second method consists of so locating the tumbling shaft that the link hanger does not oscillate equally each side of the vertical line, but more on one side of this line than the other, the effect of which is obviously to cause the entire link to bodily rise and fall during its movement. These two methods are usually described in detail in discussions of this kind, with diagrams showing how the location of the suspension stud and of the tumbling shaft may be laid down upon the drawing board. In point of fact, however, they are not so

* As this article goes to press, Mr. Harry Cornell, of Louisville, Ky., calls my attention to an article of his in the "Brotherhood of Locomotive Engineers' Journal" for October, 1896, in which he points out that the offset of the saddle stud decreases with the length of the connecting rod. It does not appear, however, that Mr. Cornell went far enough to discover the real source of the error or the real purpose of the offset.

located, and, moreover, the second method is seldom employed, as the choice of location of the reverse shaft box is usually quite restricted, and the designer is not at liberty to place it in the position which this consideration would indicate. The location of the saddle stud is determined by trial upon the engine itself, an adjustable stud being provided, shown in Fig. 15, which is bolted to the link, when, by trial adjustments, the proper position is found. The link is then removed from the engine and with the adjustable stud is taken to the link shop, where the permanent stud is made in accordance with it. In the case of a number of duplicate engines gotten out at the same time, the adjustable stud is applied to the first one only and the following engines of that lot have their permanent studs made in duplicate.

In Fig. 16 *o* is the central or neutral point of the movement of the lower rock arm and pin, at which point the valve stands centrally over its seat. This point is found in the diagram by placing the link in the mid gear and the crank on the two centers successively, these positions being shown in Fig. 20. In these positions of the crank the valve and lower rock arm pin occupy the extreme points of their travel for the mid gear and a point half way between the extreme points of the pin locates *o* of Fig. 16. Measuring to the right and left of *o* a distance equal to the lap (the two rock arms being supposed to be of equal length), locates points *i* and *n*, at which the ports are opened or closed, according to the direction of the movement.

The valve sketches above and to the right in Fig. 16 show the valve in these positions, the upper sketch showing the valve in the act of cutting off steam for the rear port, while the lower sketch shows a similar action on the forward port. The sketch shows the link in skeleton diagram suspended in the usual manner by a hanger which again is suspended from the reverse shaft arm. It will be seen that this hanger is not attached to the link over tne center of the link arc, but at a considerable distance in the rear of this arc, and it will be seen at once from the diagram that the point *i* of the link at which it acts upon the link block for the forward port cut-off is farther removed from the center *t* of the link arc than is the point *n*, at which it acts upon the block for the rear port cut-off. In other words the link is nearer the full gear position for the forward port cut-off than it is for the rear port cut-off, in consequence of which the forward port cut-off is made later and the rear port cut-off earlier than they would be if the saddle stud were placed immediately over the link arc.

The positions shown in Fig. 16 may be traced through with advantage as follows: If the crank be placed upon the forward center *O A*, the forward eccentric will occupy the position *a* and the backing eccentric the position *b*, while if the crank occupies the back center *O B*, the forward eccentric will be at *a'* and the backing eccentric at *b'*. If the cut-off is to be equalized at one-third stroke, points *c d* may be laid down such that *A c* and *B d* equal one-third of the stroke. Then with a radius equal to the length of the connecting rod, arcs *c A'* and *d B'* may be drawn giving crank position *O A'*, which the crank occupies at one-third stroke of the piston in the rearward motion, and *O B'*, which it occupies at one-third stroke of piston in the forward motion. Taking the distance *e f* in the dividers and laying it down from *a* and *b*, point *g* is obtained which the forward eccentric occupies and point *h* which the backing eccentric occupies when the crank is at *O A'*. These points locate the eccentric rod pins at *g'*, *h'* and give the link position shown in the full line, for cut-off at crank position *O A'*. Similarly by laying off *j k* from *a'* and *b'*, we obtain point *l* for the forward eccentric and *m* for the backing eccentric when the crank is at *O B'*. These points again locate the link in the dotted position for cut-off at crank position *O B'*. It will be seen that if the reverse shaft arm *p q* be located as shown, so that the hanger swings equally each side of the vertical, points *r s* will occupy a horizontal straight line, and if the reverse shaft be so located that its arm is in the horizontal position when the link is raised to the mid gear, it will be raised as much above the horizontal line for one-third cut-off in the backing motion as it is here in the forward motion, when *r* and *s* will again occupy a horizontal line above the center line and the cut-off will be equalized for the backward motion as the diagram shows it to be for the forward motion, and it is in this way that the reverse shaft is located. It will be seen that this method of hanging the link introduces the element of slip, by which the link rises and falls on the block. Formerly it was thought desirable to reduce this slip as much as possible, and even to be satisfied with a motion which was not perfectly equalized in order to accomplish this, but at the present time constructors do not seem to be afraid of considerable slip. *(To be continued.)*

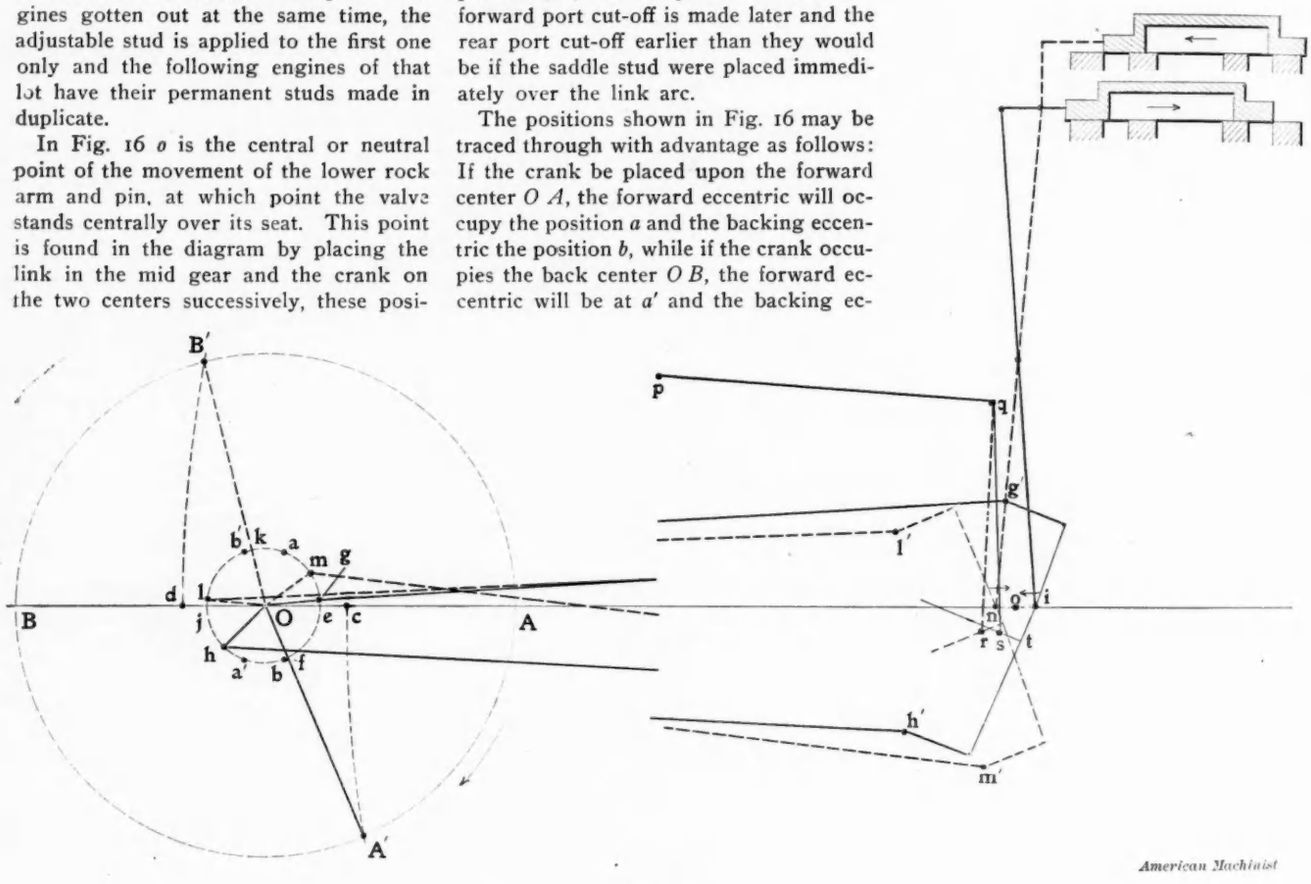

Fig. 16
THE ACTION OF THE LINK.

Inside Micrometer Caliper.

We present herewith illustrations of two different sizes of a new inside micrometer caliper which has been brought out by the L. S. Starrett Company, of Athol, Mass. This caliper consists essentially of the ordinary micrometer screw with graduated barrel, at the rear of which is a hardened steel contact piece. The range of the screw in the larger caliper is 1 inch, and that of the smaller ½ inch. Above the sleeve to which the graduated barrel is attached there is an opening which intersects a central hole to which the graduated extension rods are fitted. These rods are carefully marked, in the case of the large caliper in 1-inch intervals and of the small one in ½-inch intervals, and at one side of the opening referred to is an initial or zero line, as indicated. The figures stamped on the rod indicate the length to which the caliper is set when the graduated barrel is at zero and any movement of the latter therefore adds to the measurement over all. The extension rod in the larger caliper is clamped by the small knurled screw shown at the side, while one of the screws shown below it, and which somewhat resemble the trunnions of a gun, clamps the nut upon the micrometer screw, thus preserving the setting of the caliper. Suitable extension rods are provided for the larger caliper which make it measure up to 28 inches in length, its minimum measurement being 8 inches. The small caliper measures from 2 to 8 inches. Though intended primarily for inside measurements, it is, of course, obvious that outside calipers can be set to them.

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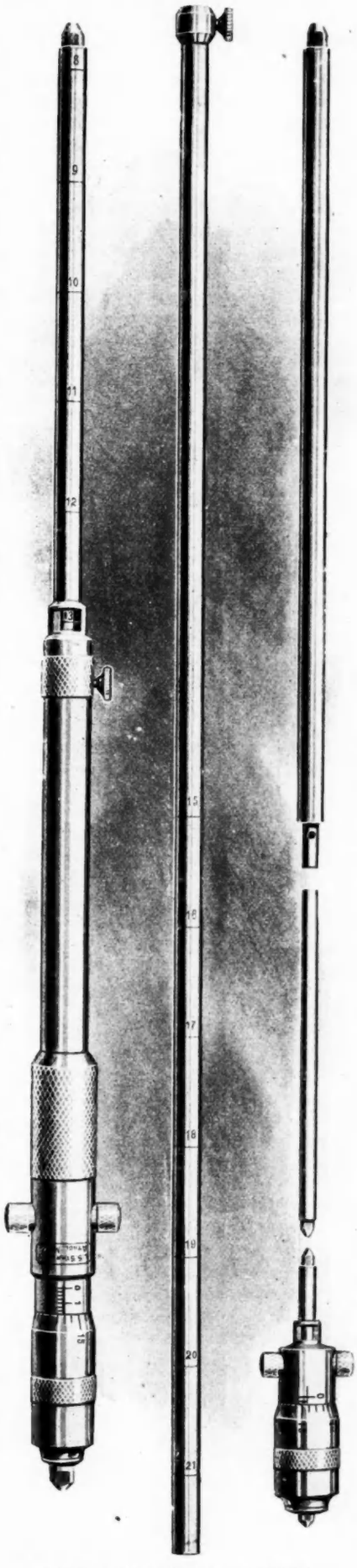
The Place of Our Destination—XI.

AN ANCIENT DRAWING—BRIDGES, WINDMILLS.

Editor American Machinist:

Cologne is a building with a city around it and the building is the cathedral, and the cathedral is peculiar in many respects, is 500 feet long, 200 feet wide, 150 feet up to the point in the ceiling inside, has three spires, one 300 feet high and two 500 feet high, but they do not look it by 150 feet. Why they do not look higher than Norwich and Salisbury, which are 150 or 200 feet lower, is, I fancy, partly because there are two of them, because they are very massive and because they have such immense finials at the top—these finials cannot be less than ten or fifteen feet in size—ornamental carvings. The building was begun several hundred years ago, and the back part of it finished so as to be used as a church for three or four hundred years and by Napoleon as a horse stable for a time. In the beginning of this century they concluded to finish it and did so in 1881, and what is the most remarkable part of it is, that it was done from the original plan, which is still preserved in the cathedral, and interested me most of all.



INSIDE MICROMETER CALIPER.

This plan is a front elevation drawn on parchment showing the structure complete in every detail, except the statues, is drawn to a scale of about ¼ inch to the foot, the drawing being nine or ten feet high. During the wars it had been torn in two, and one-half was found in France and the other in Germany. On close inspection the drawing shows that they had no such instrument as an inking pen, as every line straight and curved had been traced with an ordinary pen. Of course the draftsman must have used India ink, as any of the writing inks would have faded out years ago. This drawing is known to be about 700 years old. As the old cathedrals were planned by priests, whose trade was to be priests and not architects or builders, and as they had no opportunity to learn the trade or grow up in the business, they must have been gifted with genius. Another curiosity in the cathedral is a safe deposit vault, where are deposited and shown more gold and silver and jewels, cups and vases and caskets, boxes, swords and shrines than could well be drawn on a one-horse wagon. Many of the things are beautiful, sacred and priceless.

We think the Germans take a lot of letters to spell things, but on Cologne which they spell with four letters Köln, and cathedral, which they spell with three, they redeem themselves. A second sight in the city, which is a very clean one, and in itself a sight, is the bridge of boats with a swing in it, and the way they drop the swing down stream to open it and pull it back to close it is quite odd.

It will be seen that in going from Cologne to Rotterdam as we have, it was a good deal of a back track, but by keeping on the east and north side of the Rhine, we came direct into Holland and it gave us a good sweep of the country. When one goes straight through a country he thinks he can get a pretty fair idea of it, and yet a good wide line to represent a railroad covers about as much of the country as one can see so as to form an opinion of. To us very much of the east part of Holland is like other countries, but the west is Holland as it has been described to us—land below the sea level with ditches and dykes. The land for acres and miles is dead level in the main, and divided into lots, generally long and narrow, by ditches varying from two to ten feet wide and the ditches filled with water up to within a foot or two of the level of the land. So the fields are fenced by ditches and the farms are in some cases 10 per cent. water. When rain fills the ditches too full windmills pump the water from the ditches into dykes, which are high enough for the water to run into the sea.

Rotterdam, Amsterdam, and the cities between are strange old places, and in both the above mentioned places the buildings are largely built upon piles, and time has played strange freaks with many. In Amsterdam there are lots of old build-

ings by the side of new, where they are in line at the bottom and the old building projects a foot or more beyond the other at the top. They simply settled and leaned over, that's all, and did not fall down when they ought—brick work never does! Rotterdam, a place of about 250,000 people, has some fine buildings, and the railroad is carried on a viaduct across the city.

When Antwerp lost its prestige as a great commercial city, Amsterdam took its place, and in the early part of the seventeenth century it was the largest commercial city of Europe, and is now a city of half a million people. The streets are wide, with usually a canal in the center and with bridges innumerable. It lies

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AN OLD-WORLD BRIDGE.

between the North Sea and Zuyder Zee, which itself covers what is known to have been once a great farming region. Centuries ago it was dammed up from the North Sea, the water pumped out, and the region—for it is many hundred miles square in extent—was a rich agricultural one. In fact, the crops of grain all through this part of the country are such as one does not see anywhere else. One always hears of the windmills of Holland. They are, compared to anything one sees in America, immense things, the arms being from 25 to 30 feet or more in length, sweeping in a circle of 60 feet, with its shaft at the top of a round building from 35 to 60 feet high, and with a dome roof which turns around like the dome of an observatory. In the place of a tail, such as constitutes a part of the boys' windmill, they have in some cases a small mill set crossways to work the main mill into the wind, but generally there is a long lever extending back and within reach of a man, and the mill is kept facing the wind by hand. It is said there are 500 of these mills within five miles, but I do not believe we saw 500 altogether, though it may not have been a very good day for windmills.

From Amsterdam we came on east through Bremen, on the Weser, where the North German Lloyds steamers sail from for New York, and through Hamburg-on-the-Elbe, where there is a bridge that comes very near being a pretty one. I send an outline sketch of it, the right-hand side showing it as it is, and the left-hand how it could have been finished off to advantage in looks, and this reminds me of how much the Brooklyn Bridge could have been improved and cost a good many thousand dollars less by changing the camber of the approaches from a camber to a reverse curve with the main span.

Kiel, a city on the Baltic Sea, is at one end of the great canal cut through the peninsula between the Baltic and the North Sea—sixty miles long, and large enough to float the largest steamers; 30 feet deep, I believe, as against 22 feet for the Chicago drainage canal. A six or seven hours' steamer ride brings us across a branch of the Baltic to Korser, in Denmark, and two hours across the country to Copenhagen, a city we hope to see more of later. Another two hours' steamer ride to Melmo—a nice city of 125,000 people, which few of us have ever heard of—and sixteen hours', and four or five hundred miles' ride, by a Swedish night train, to Stockholm, a place six hours ahead of New York in time, a quarter of the way around the world, and one-third of the way towards the North Pole. As all places in the world have just as many hours of sunshine as any other place during the year, and as they got behind the rest of the world last winter, the sun is now (last of June) making up lost time, and gets up in the morning.

The grain grows the whole time. Farmers work from 3 in the morning till 10 o'clock at night; and the nights are so short that one has to stay over a day before it gets dark enough to see to go to sleep, and he has to stay a week to get his money's worth out of the price of a night's lodging. In coming up I told the time every hour of the night by my watch, without the aid of artificial light.

The country through the eastern part of Holland and Northern Germany did not appear much different from many sections of our country, except for now and then a windmill, and it was along Northern Germany where we struck the first of the windmills sitting on posts. To explain—there is first laid down, probably on foundations, cross timbers, and on the intersection a post set up and securely braced. On top and around this post the mill building is built and fixed to turn around upon it; the mill being, at least in some cases, 20 or more feet high, with a gable roof. Through this roof goes the shaft of the windmill, and when the wind changes, the whole building is turned around by a lever to bring the sails into the wind.

To further explain that—none of these large mills have wood wings, such as we are in the habit of seeing; but the four long arms (and we have seen but one with six) have a row of pegs set in them, projecting back, and two set twisted like a propeller screw, and over these pegs is drawn a canvas of sail cloth, which forms a sort of sail or wind screw. When they stop the mill the sails are removed.

These mills where the building turns are for grinding grain, I suppose, and turning the building with the mill saves complicated mechanism. For fear you will think this a pretty big story, I will add that the buildings are not very large—not over 16 feet square, I should judge.

While it is generally true of all the country we have passed through, it is specially true of Denmark, that the farming and crops are excellent, and such a thing as a spear of foul stuff in the growing grain is not to be seen. The churches of Denmark are a curiosity, and, outside the cities, all apparently alike, and, like the army and police, they are run by the government. Imagine plain, straight gable buildings, 30 or 40 feet wide and 80 or 90 feet long; take the front, 15 or 20 feet, and build it up two stories higher, with exactly the same piece of roof on top as was removed from below, and you have the Danish church. The country retains plenty of forest, and the people, rich and poor, live in these woods in the summer.

One would naturally expect things wonderfully strange in Sweden; but in many places sections could be cut out of Sweden and central New York and changed places, without one's noticing the change, if you could not hear the people talk. Sweden is, however, in the main, much more level, as I do not remember either cuts or fills or tunnels until we were coming into Stockholm, the beautiful.

JOHN E. SWEET.

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A Unique Train Record and the Engineer Not Forgotten.

The following letter addressed to Charles H. Fahl, the engineer of the "Reading Flyer," explains itself and will be appreciated by our readers:

"Your performance with train No. 25 during the past two months deserves special commendation. This train, now withdrawn for the season, was scheduled to run from Kaighn's Point, Camden, to Atlantic City, fifty-five and one half miles in fifty-two minutes, or at the rate of sixty-four miles per hour. Owing to the inability of the ferryboats to reach Camden on schedule time the train always left late, the average detention from this cause being upward of two minutes. On the other hand, you so ran the train that this loss was invariably made up, the train arriving at Atlantic City always ahead of time, this average being also two minutes, so that the record shows that for the fifty-two days the train ran, from July 2d to August 31st, the average time consumed on the run by you was forty-eight minutes, equivalent to a uniform rate of

speed, from start to stop, of sixty-nine miles per hour.

"On twenty-two days the train consisted of five cars, on thirty days it was made up with six. On no occasion did it fail to arrive at Atlantic City on time.

"This performance, I believe, has not heretofore been equaled in the history of railway service, either in this country or abroad. It is one of which the management is proud, and is a credit to the track, the equipment, and especially to the skill and ability with which you performed the task entrusted to you.

"I take pleasure in offering you my thanks for the fine service you have rendered the company. Yours very truly,

"THEODORE VOORHEES,
"Vice-President."

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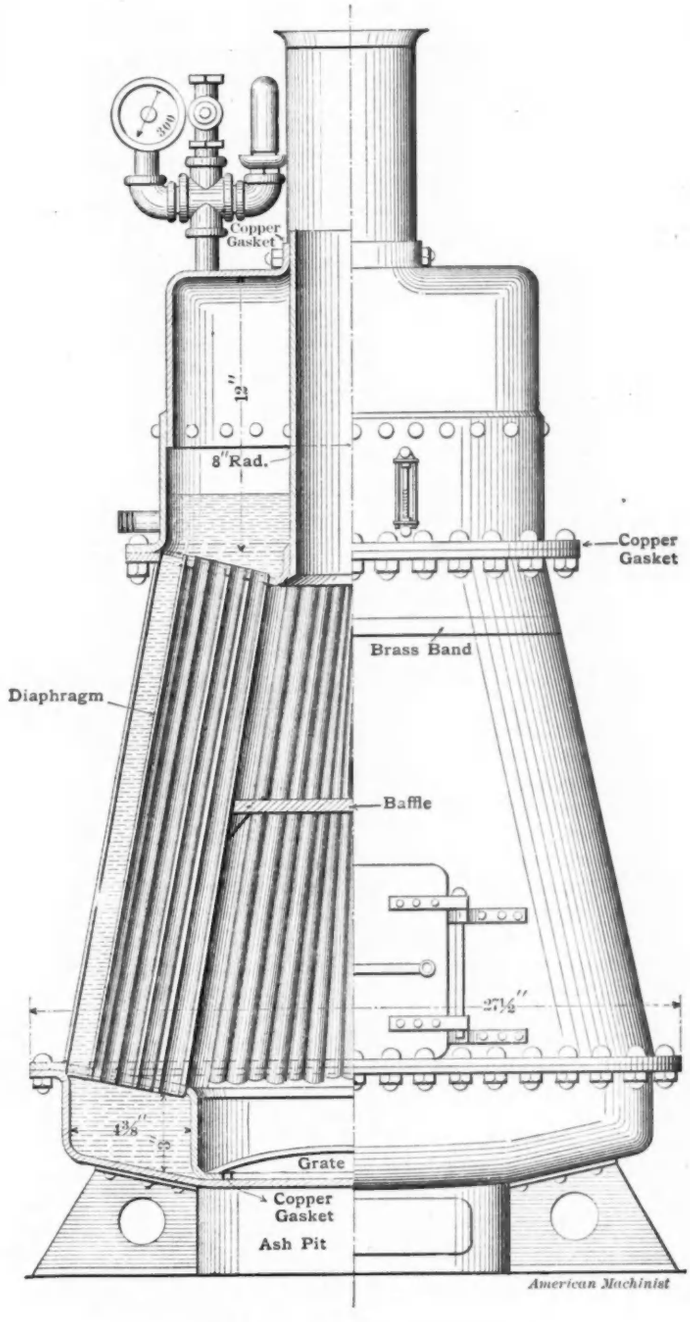
The Watson Radial Water-Tube Boiler.

The cut herewith gives a good idea both of the external appearance and of the construction of a boiler which has recently appeared as a candidate for engineering favor. The drawing is from a small boiler with a grate 13 inches diameter. There are sixty-eight straight 1-inch tubes 20 inches long, which are expanded into the upper and lower flue sheets, and connect the upper and lower water chambers. The latter entirely encloses the fire-box, the top of the grate being above rather than below the water. The tubes, as will be seen, are not vertical, but incline inward towards the top. They are staggered so that the gases will properly impinge against their surfaces; a horizontal baffle-plate is also provided about midway of their hight. These steam generating tubes are surrounded by a conical partition or inside jacket, and outside of this partition are a number of downcast tubes, by which the water returns to the lower water chamber, thus maintaining an excellent circulation. The boiler, as will be seen, is easily taken apart and put together, and every part is thus accessible for examination or repair. It has been approved by the Supervising Inspectors of Steamboats, and complies with the marine laws in all respects. Boilers may be made of any size up to 500 horse-power, and for pressures up to 250 pounds per square inch. The designer and builder of the boiler is Egbert P. Watson, Downing Building, New York.



THE WATSON WATER-TUBE BOILER.

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Small Sprocket Wheels.

There is a strong tendency amongst bicycle makers in pandering to the public taste for lightness of parts to reduce the size of the sprocket wheel on the rear axle. That this is a mistake is proved by an experiment recently made to determine the comparative efficiency of sprockets of different sizes. To carry out the experiment the bicycle was inverted, and the frame securely attached to the floor. A thin steel band had one end attached to the tire, and the other end carrying a weight which was raised by the band being wound upon the tire, a second weight being hung from a scale pan attached to the pedal, whence the efficiency of the portion of the mechanism transmitting the power could be calculated. A long series of readings were taken with the same large sprocket and with seven, eight and nine-toothed sprockets on the rear, and with pedal weights varying from 2 pounds to 50 pounds. The average efficiencies in each case were as follows: 7-tooth, 89.9; 8-tooth, 91.5; 9-tooth, 93.4. This shows the 8-tooth to have 98.9 per cent. of the efficiency of the 9-tooth, and the 7-tooth to have 96 per cent. of the efficiency of the 9-tooth sprocket, other conditions being equal. The result proves that there is less chain pressure upon the teeth of the larger wheels, and hence less wear.—"The Engineer."

At the Phœnix Iron Works, Phœnixville, Pa., on September 15th, Charles Schaffer, working at a radial drill, was caught and whirled around, and had his clothing all torn off; his abdomen was pierced, and it was thought that he could not recover. Schaffer was 66 years old, chief of the Phœnixville fire department, and the oldest volunteer fire chief in the State.

A Shop Fire Department.

What we are disposed to consider the most completely organized and most thoroughly equipped shop fire department in the United States is maintained at the establishment of J. H. Williams & Co., Brooklyn, N. Y. The business of this firm, as our readers know, is the manufacture of drop forgings. The shops are in a fully occupied portion of the city, and they have the usual protection furnished by the city fire department, but a special installation of apparatus has been made and a special organization of the employés effected, which guarantees instant and efficient means of combating fire independently of all outside assistance. The system has principally been worked up by Mr. W. C. Redfield, the treasurer of the company, and he is constantly in charge of the entire organization.

The plant of the company consists of a four-story building, embracing Nos. 9 to 31, inclusive, on Richards street, and at right angles to it a long high single story forge building, with monitor roof on Bowne street, extending from No. 8 to No. 26 on that street. There is a street also on the third side of the rectangle occupied, and in the yard is the power house with case hardening and storage sheds, etc

The first attention has been given to precautions for preventing both the starting of fire and its spread if started. The best time to avoid fire-loss is before the fire begins, and the next best time is in the incipient stages of a fire. Cleanliness is insisted upon everywhere; fires are not so likely to start in clean places. Let no rubbish accumulate. Use no sawdust. Keep clean waste in the iron cans or tin cabinets provided for it, and burn all oily waste daily. Keep shaft bearings free from accumulations of oily dust.

The stairways and elevators for the main building are in a tower on the yard side of the building, with self-closing fireproof doors at each floor. Five belt openings through the floors are made as small as possible, are lined with galvanized iron, and each protected with a special sprinkler.

Grinnell sprinklers are very liberally distributed through the establishment, being put in many and unusual places, covering every room, stair, roof, shelf and closet in the works, connected with a 10,000-gallon tank 13 feet above the highest sprinkler, and with 8-inch discharge fire pump; water pressure always 70 pounds. Sprinkler valves sealed open and inspected daily. Dry pipe system in portions exposed to cold. The factory stairs and elevator shafts iron lined, are further protected by two "Jumbo" automatic sprinklers.

The engine room is divided from the fire-room by a brick wall, and the only opening is protected by an automatic fire door.

The principal fire-extinguishing apparatus comprises:

A Worthington Underwriter Duplex Fire Pump, 750 gallons, 16 x 9 x 12 inches, throwing three 1⅛-inch streams; drawing water from four 6-inch driven wells, which have no other connection. Steam is on this pump always. The pump is used daily; it has independent steam pipe to boilers, not connected with the engine supply. We entered the pump room unexpectedly, and upon order the engineer started the pump in our presence and had the full fire service water pressure on in 1 minute and 10 seconds. Eight lines of 2½-inch underwriter rubber-lined cotton hose are always in connection with this pump, two attached directly to the pump, two attached to a fire hydrant, and four to a 3-inch stand-pipe in the elevator tower for the four floors of the main building. A 2½-inch stand-pipe runs from the pump to a 1½-inch fixed monitor nozzle on the power house roof which commands the entire block. A 3-inch stand-pipe runs from the fire pump up through the stair tower, and ending on the main forge roof with a hose and nozzle commanding all the adjacent buildings, and throwing across the street to the building of the Worthington Pump Co. Stand-pipe valves are strapped open and pressure is always on them when the fire pump starts. Both stand-pipes have drips to prevent freezing. A supply of 6,000 gallons of water in a reserve tank is sufficient for steam for the fire pump for two days, if the city service should be shut off.

What is called the auxiliary fire apparatus is as follows:

Two Worthington Duplex Pumps, 4½ x 2¾ x 4 inches, used singly or coupled, attached to 5-inch driven well and city supply. Both may draw also from a 6,000 gallon reserve and priming tank. 125 feet 1½-inch linen hose, with 5-16-inch nozzle, attached to small pumps. 150 feet, 3 lengths, 1-inch linen hose, with 3-16-inch nozzles, attached to city supply in factory building. 95 feet, 3 lengths, 1-inch rubber "test" hose, with ¼-inch nozzles, overhead in main forge, attached to city supply. 25 feet, 1 length, 1½-inch rubber hose, attached to priming tank, in case-hardening shed, ⅜-inch nozzle. 44 fire pails distributed through factory. The fire pails, alas, have the hemispherical bottoms. 2 "Rex" fire extinguishers; one in carpenter shop, one in forge No. 2. Electric telephone system throughout works. City fire-alarm box, regular station No. 814 of city department, in factory, connected with 4 auxiliary alarm boxes in works. Position of fire-alarm boxes indicated at night by red lights. American watchmen's time detector system, 8 stations. 2 night watchmen and night engineer. Engineer for fire-pump on duty Sundays and holidays.

The organization of the men and their assignment to specific duties in case of fire will perhaps be best understood from the following, which is a reproduction from the fire department manual issued to all hands. The first page is here reproduced:

Fire Signal is a Continuous Blast of both Steam Whistles.

In general charge.....Mr. Redfield
Assistant.....Mr. Amborn
Engineer.....Mr. Reeve

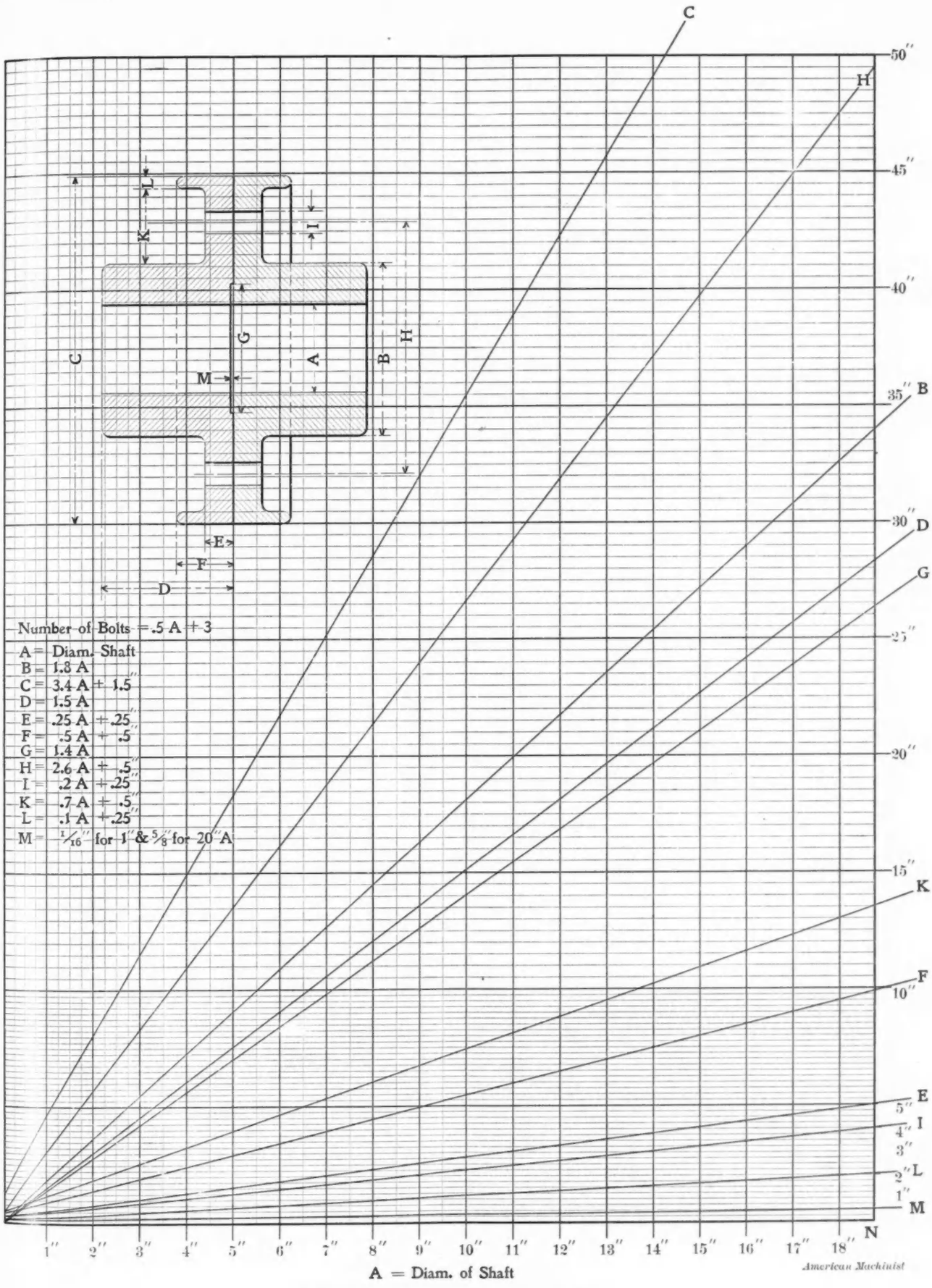
Main Forge.

In charge.....Mr. Conner
Assistant.....Mr. J. Prindeville
City alarm.....Mr. Connor or Quinn
Right-hand hose from pump house, Ellis (in charge)
Right-hand hose from pump house, Roller
Right-hand hose from pump house, Hamilton
Right-hand hose from pump house, Head
Hose from fire hydrant..Begg (in charge)
Hose from fire hydrant.....Frank
Monitor nozzle, power house roof, Geo. McCann (in charge)
Small hose, engine room window, Farrell
Small hose lines on platform, front, Griemsman
Small hose lines on platform, center, Gullickson
Small hose lines on platform, rear, Howe
Fire pails on platform.....Schaffer
Fire pails on platform.....McCarty
Fire pails on platform.....W. Dotten
Close windows and doors, overhead, Griemsman
Close windows and doors, overhead, Gullickson
Close windows and doors, overhead, Howe
Close windows and doors, below..Hanley
Close windows and doors, below, MacLure
Inspect apparatus weekly.....Ellis

The men in every other department of the works as follows: Die room and shipping room, trimming room, finishing room, fourth floor, yard, power house, hose lines, forge No. 2, are also assigned to their individual duties. Night, Sunday and holiday service is also specially provided for. Drills occur at regular times, and occasional unexpected calls are made as tests of discipline.

In case of fire each department will act under its own head, in charge of Mr. Redfield, Mr. Amborn or Mr. Reeve. Each man will take his own place and do his own work, not another's. Use care with water; it often does more damage than fire.

Much of the above information is gathered from the fire department manual published by the firm, and referred to above. We need not say that the system is thorough and efficient, and it should be of interest to all shop proprietors or managers.



PROPORTIONS OF FLANGE COUPLINGS.

Diagram of Proportions for Flange Couplings.

Mr. N. J. Hopkins, of Schenectady, N. Y., sends us the annexed diagram which explains itself. It has been made up from various published scales of proportions and from the work of various makers of such goods. Mr. Hopkins calls attention to the method of constructing such diagrams by first designing the extreme sizes, plotting them and then connecting the points by lines for the intermediate sizes. These intermediate sizes can then be taken from the diagram at any future time as wanted, and will result in harmonious designs instead of a miscellaneous hodge podge which such things are too apt to become as time goes on.

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The Latest Roller Boat.

Our friends very kindly keep us informed of the various freak inventions which are constantly appearing in different parts of the country. It is only occasionally that we can feel warranted in giving our space to a description of one of them. As every other industry must in these days have its "organ," it might be proper to have also a journal of freak inventions.

We hold knowledge to be the essential guide to intelligent and profitable invention, and as a consequence it is the lack of knowledge, theoretical and practical, that we usually find most intimately associated with freak inventions. When a new and absurd and utterly illusory system of marine propulsion is proposed we do not expect it to emanate from an educated marine engineer. The Knapp roller boat recently launched at Toronto is the invention of a barrister, which may, perhaps, account for it.

In the Bazin roller boat, which lately showed how fast it could not go in France, it will be remembered that the axes of the rollers were at right angles to the direction in which the apparatus was to travel. In the Knapp roller the axis of the single roller employed is parallel with the line of movement. The idea is to have the roller keep revolving on its axis and to screw itself along through the water by means of a lot of helical blades projecting from the periphery. The roller is to be revolved as a wheel is revolved by a squirrel within it, an engine, or pair of engines, with boiler and all appurtenances taking the place of the squirrel. The actual "boat" lately launched and soon to be ready for trial is 22 feet in diameter and 110 feet long. It is externally cylindrical for most of its length with a frustum of a cone at each end, tapering to 15 feet diameter. A track similar to a railroad track is laid around the interior of the boat on each end, and on this track is supported, on suitable wheels and axles, a platform to carry the engines, boilers and other apparatus. The platform will be set as low as possible, and all the weight being below the center, everything within will be expected to keep right side up, or rather down, by the action of gravity alone. There will be two sets of engines, each of 200 horse-power, and boilers to match. There will be no gearing to the shell. When the engines are put in motion and they in turn act on the axles and wheels of the platform the entire internal weight will begin to climb one side of the roller, and, of course, the roller will turn and then, of course, the starting blades on the outside will make it move along through the water. Whether the platform and all within will not oscillate more or less, or whether something may not some time get caught and the entire contents go whirling over and over together we do not wish to say. The invention is certainly a daring one, and the man who furnishes the $25,000 for this first "experiment" is, perhaps, most daring of all.

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Value of Shop Experience to the Engineer.*

A few words now in reference to that physical and mental training gained laboriously, and somewhat wastefully as I think, at the joiner's bench, in the fitting and turning shops, the foundry and the forge, during the old course of mechanical engineering apprenticeship. I am convinced that the kind of knowledge which comes of thoughtful chipping and filing and turning and forging, though only applied to a few of the materials with which in after-life the engineer has to deal, are quite as important as tables of density and strength to his future sense of rightness in constructive design. The use of such work is not merely to teach one the parts and combinations of any particular machine; in a still higher degree it is the insensible mastery of a much more subtle knowledge or mental power, the application of the senses of sight and touch and force, it may be of other senses also, to the determination of the nature of things. (I am not going to apologize for referring to the sense of force. The vexed question of its separate existence appears to me to have been settled fourteen years ago by Lord Kelvin in his address at Birmingham on "The Six Gateways of Knowledge," and I may well leave it where he left it.) I should altogether fail to describe adequately what this mastery means. It appears to me to be inscrutable. The value and nature of the power can only be appreciated by those who have experienced it, and who have felt its defect in those of their assistants, or in others who do not possess it. But the great workshop training has still further advantages. The apprentice is surrounded by skilled workers, from whose example, if he is wise, he learns a great deal; and apart from this, it is no small profit to have rubbed against the British workman, to have discovered what manner of man he is, and to comprehend how little the world knows of his best parts. The whole time spent in large engineering works cannot, however, be equally beneficial; the apprentice must take the work as it comes; the most interesting or instructive portions cannot be reserved for him, and he often feels that some of his time is being wellnigh wasted. A few years ago I should not have thought it practicable usefully to substitute for such a course anything that could be undertaken in a student's workshop, however organized; but the impossibility, in many cases, of including such experience without neglecting something equally important has led me to view with satisfaction the introduction of workshop training into certain schools of applied science in England. Such a change cannot, of course, carry with it all the advantages of experience in the great workshops and of contact with its workers, but those advantages which it does retain may be secured in a shorter time where there is no commercial interest to be served.

* From an address by G. F. Deacon, M.T.C.E., at the Toronto meeting of the British Association.

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Dies for Punching Blanks for Grooved Armature Cores.

BY WM. BAXTER, JR.

The use of cutting dies in sheet metal work is so common at the present time, that a description of the construction of those used for any particular purpose might be regarded as superfluous by those not engaged in a line of manufacture requiring such tools. Those who are extensive users of dies know, however, that in most cases the construction of each new set is changed so as to embody the improvements suggested by the use of the set they replace; and that frequently a standard form is not reached until the third or fourth set has been made. In view of this fact it is believed that a description of the forms designed by the writer for punching armature core blanks, together with the objects sought to be accomplished thereby, may prove interesting to those engaged in similar lines of work.

When grooved armature cores are built up of sheet iron rings, it is not necessary that the grooves be all equally spaced, inasmuch as the teeth can be made to match by simply assembling the rings, in building up the core, so that the grooves punched by the same part of the die come on top of each other; and this can be accomplished very easily by putting one of the rivet holes out of place to such an extent that the unequal spacing may be readily detected by the eye. When the core is built up of segments the case is very different, for then it becomes necessary to change the position of the segments in each layer, so as to break joints. Otherwise the construction would not be strong. On this account the spacing of the teeth must be more accurate to en-

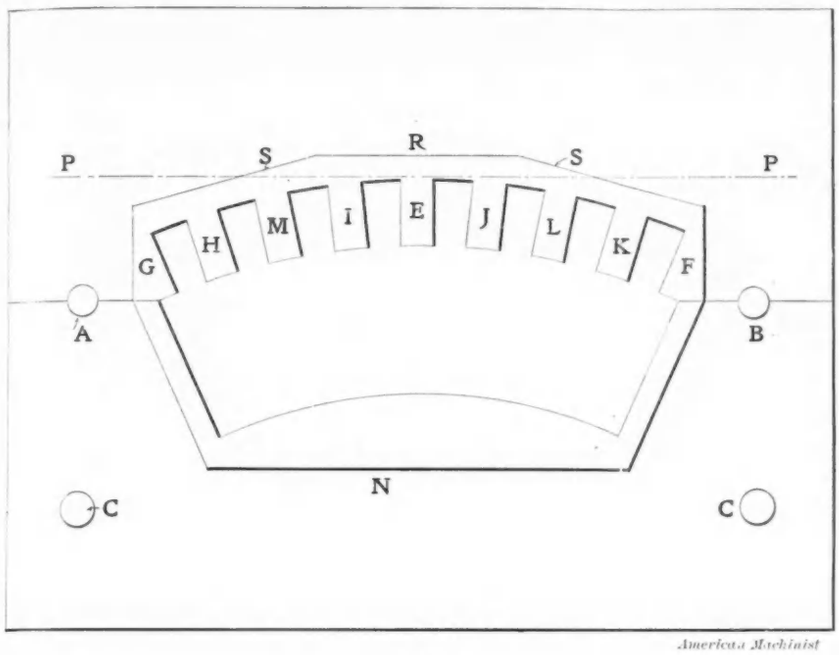

Fig. 1
PLAN OF ARMATURE DIE.

able them to match well when assembled in the core. As can be seen from an inspection of Fig. 1, which is a top view of the die for cutting segments of one-eighth of a circle, equal spacing of all the teeth is not necessary to make the grooves come in line. If the blanks are placed in the core so that the ends of those in one layer come to the center line of those in the preceding layer, the teeth will come directly on top of each other if the spaces *F* and *G* are equal to one-half of *E*, and *H* equals *J*, *M* equals *L* and *I* equals *K*, all the teeth being of the same width. There is no difficulty, however, in making such a die with all the teeth very nearly equidistant, but to make sure that the blanks will match when assembled in the core, all that is necessary is to file up two templates with the grooves accurately spaced, and then dress them as much as may be required to make the teeth come in line when lapped upon each other from either end to the center line.

The first die can easily be made so that the blanks will come out as accurate as may be desired, but in time a new one will be required, and it is then that the trouble begins. As everyone knows, steel shrinks in the hardening process, and the amount it shrinks is not by any means uniform. On this account the duplication of the first die becomes a difficult problem. The difficulty can be greatly reduced by making the die in two parts as shown in the figure. When this course is pursued, a sufficient amount of stock can be left around the teeth to make up for any deviation in the shrinking from the amount expected, and after the die is hardened, it can be ground to the shape of the original die by means of suitable emery wheels. It is not easy to grind into the sharp corners, but with a very fine wheel, brought to a sharp edge as often as necessary, nearly all the metal can be removed, and the small amount that remains can be cut out with a fine-cut file of good quality. There are many forms of dies that can be made advantageously in two parts, and there is no danger of the edges breaking off, if the division can be made at points where sharp corners will not be produced. Two well fitted taper pins at *A B*, about three-quarters of an inch diameter, will keep the parts in their proper position.

A defect that is quite common with punching dies is that the guide strip at the back either does not fit close against the surface of the die so as to prevent the metal from sliding under it, or else the corner of this strip wears away by the constant sliding of the sheet metal against it. The effect in either case is that the blank is punched further from the edge than it should be, and unless an unnecessary amount of stock is allowed in the scrap, the blanks cut from the oposite side of the strip will be liable to come out defective. If the surface of the die is

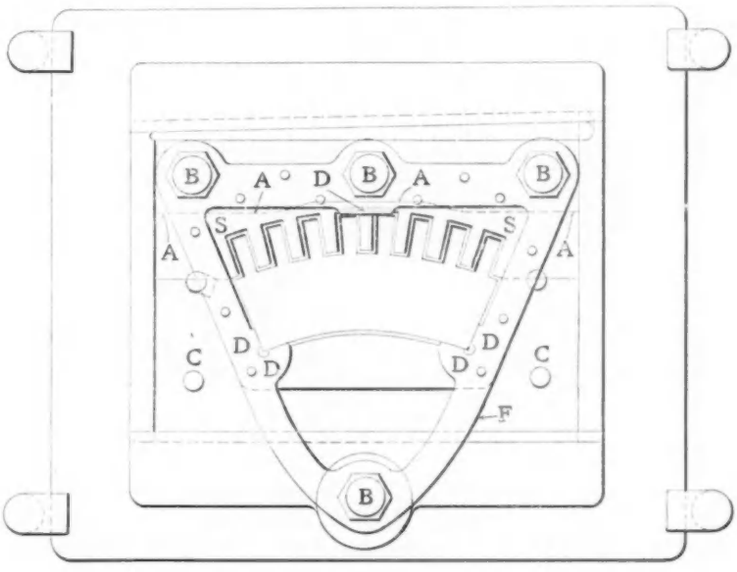

Fig. 2

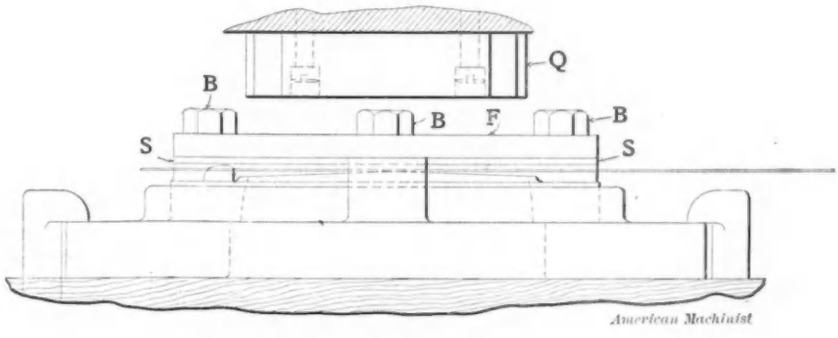

Fig. 3
DIE, STRIPPER AND FRAME IN PLACE ON BOLSTER.

ground flat, and the sheer is given to the punch, the trouble can be obviated to a great extent, but when the punch is sheered the blanks will not come out as straight as when it is left flat. In the die here shown the raised surface around the cutting edges, that is within the line *N*, is trimmed as close as thought safe on the side where the guide strip goes, as shown by the lines *R S S*. The guide strip, which has its face on the line *P P*, is cut away in the center so as to span around *R*. It rests upon the lower surface outside of the line *N*, therefore the sheet cannot get under it nor can it wear away the corner, which is about three-eighths of an inch below the point where the sheet strikes. This construction is shown more clearly in Fig. 2, where the face of the guide strip is marked *A*. It is also shown in Fig. 4, where the guide strip is also marked *A*. By using this construction the die can be ground with a sheer and the punch straight, as shown in Fig. 3, and all trouble of resetting the guide strip each time the die is ground is avoided.

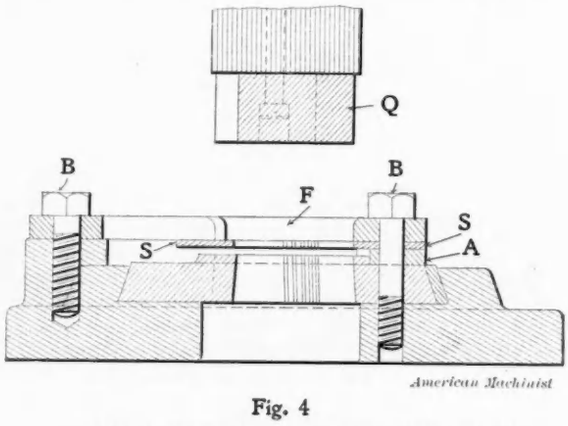

Fig. 4

SECTION OF DIE, STRIPPER AND FRAME.

The stripper, which is marked *S* in Figs. 2, 3 and 4, is made much stronger than is customary; for blanks about 10 inches long it is of boiler iron one-quarter of an inch thick, and is re-enforced by a frame three-quarters by one and a half inches. The frame is secured to the cast iron bolster by means of the bolts *B*, one of which is in front, thus preventing the bending up of the front side of the stripper, a common trouble which not only delays the work while the stripper is being straightened, but also contributes largely to the dulling of the punch. As the stripper is secured to the bolster, the die must always be held in the same position, and this is accomplished by means of pins *C C*. The bolts at the back of the die pass through holes in the latter and tap into the cast iron, therefore if by any chance the die should become loose, it would not be lifted by the stripper, but on the contrary would be held in its place. The frame *F* of the stripper is made to fit the punch at the corners, and at the middle of the back, and the effect of this is to considerably increase the durability of the apparatus. As is well known, the favorite way of setting small dies in a press is to first secure the punch in place and then move the die around upon the bed of the machine until it is line with the punch, and the latter enters it freely. This method works very nicely with small dies that can be easily moved about with the fingers, but when it is tried with a die that weighs from one to three or four hundred pounds it fails to be satisfactory, and often results in injury to the die or punch. Another method pursued is to enter the punch in the die a short distance and then secure the punch in the press, the expectation being that it will draw the die into its proper position, but it will not do this unless there is an entire absence of loss motion and spring in the press, which is never the case. If the stripper is made to guide the punch and its upper edges are rounded off, the die can be set without danger of injuring the edges of either the die or punch, and furthermore, if the press is not as rigid as it should be, the punch will not be able to spring sideways when the cutting on one side is not clean. The surfaces *D* where the striper frame guides the punch are case hardened, and will not wear away very rapidly.

The construction of the punch is shown at *Q* in Figs. 3 and 4. It is made of iron with a steel facing about half an inch thick, and is secured to a holder, adapted to fit the press, by means of screws that are countersunk so far that they will not come even with the surface until the punch is worn out.

The holding of the stripper by a bolt in front may be regarded as somewhat objectionable, but in reality it is not. The objection is that the strips from which the blanks are cut cannot be so easily removed when necessary, as is the case when the front is unobstructed, but if the die is in perfect working order, there is seldom any occasion for removing the strip, and the slight additional trouble involved is much less than that caused by the bending or even springing up of the stripper when only supported from the back. It is true it can be made strong enough when supported from the back alone, but the construction in such a case must be much more substantial than when the front fastening is used.

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Foreign Practice in Engine Proportions.

In a letter which we recently received from H. Bollinckx, of Brussels, referring to Prof. Barr's recent paper on "Engine Proportions," the following data are included, which give the practice of Mr. Bollinckx and will be found of interest here:

The maximum strain allowed upon cast iron is 1 kilo per square millimeter, equal to 1,422 pounds per square inch, and upon steel 5 kilos per square millimeter, equal to 7,110 pounds per square inch.

On crank pins the pressure allowed is 70 kilos per square centimeter, equal to 995 pounds per square inch.

On cross-head pins the pressure allowed is 90 kilos per square inch, equal to 1,280 pounds per square inch, and on cross-head slides the allowance is 2½ kilos per square inch, equal to 35½ pounds per square inch. The cross-head gibbs are of cast iron, working on the cast iron frame, which has a bearing on a recent discussion in our columns.

It does not appear whether the projected area or surface in action is used in determining the size of bearings, but we presume the former. All dimensions are computed from the maximum pressure.

The factors given are used in the construction of engines running from 50 to 120 revolutions per minute.

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No More Punctured Tires.

Henry R. Collins, a machinist employed at the Bethlehem Iron Works, South Bethlehem, Pa., has invented a wheel for bicycles which may do away with punctured tires, as it does away with the pneumatic tire itself. The essential feature of the invention is in the use of a solid tire and a pneumatic hub instead. A heavy pneumatic tube encases a central steel thimble, and surrounding the tube is a steel shell to which the spokes are attached.

We do not expect to see the invention used by wheelmen who race, however, for, as we understand the matter, it will fail in point of speed, i. e., in resilience applied where it will do the most good.

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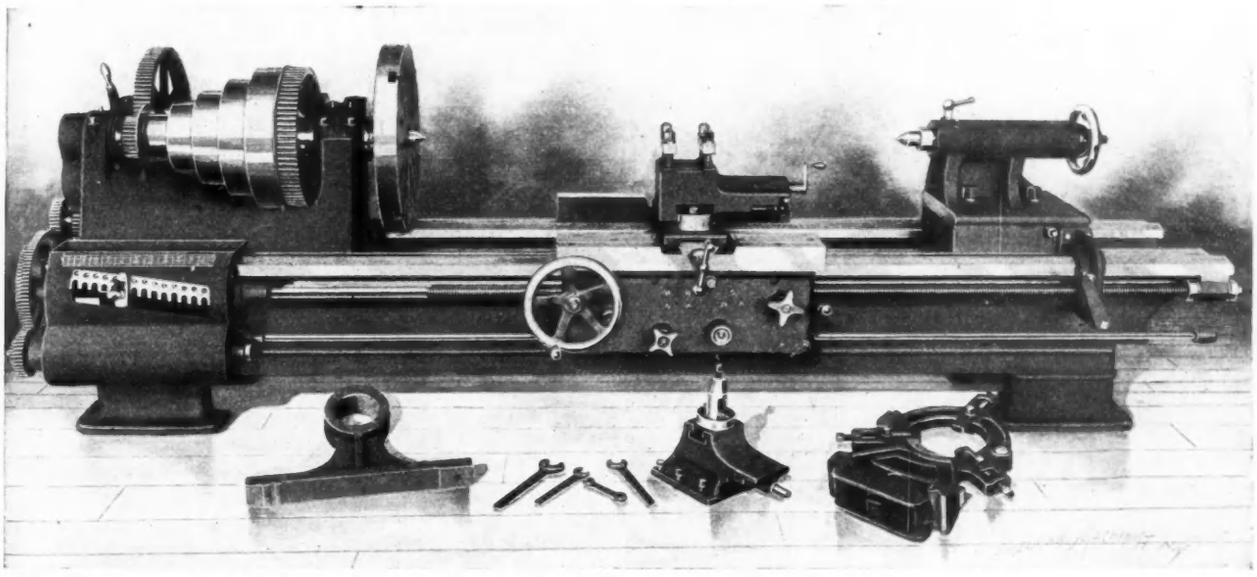
An automatic stop for lathes, planers and other tools is described as used in England. A weighted lever is connected with the belt shipper. This lever, when the machine is running, is supported by a latch. This latch can be drawn aside by an electro-magnet, when the lever falls and ships the belt, stopping the machine. The same movement rings a bell. The electric contact is made by the slide-rest or other moving part. A battery of a few Leclanche cells will work several machines.

Hendey Norton Metric Lathe.

The foreign trade of the Hendey Machine Company has grown to such proportions as to warrant the designing of a line of Hendey-Norton lathes specially for the Continental demand and, therefore, adapted for cutting metric threads. The lathe illustrated is the largest of the line (32 inches, or 305 millimeters, swing), and has a lead screw of 1 centimeter pitch—i. e., the distance from center to center of contiguous threads is 1 centimeter, or 10 millimeters. The usual arrangement of change gears enclosed in a box is retained, and there are fourteen such changes, the gears in this particular lathe being 40, 44, 45, 48, 50, 52, 55, 56, 60, 64, 65, 70, 72 and 75 teeth. In connection with these there are used, at the end of the lathe, change gears giving a relative motion of 1 to 4, 1 to 2, 1 to 1 and 2 to 1. Arranging the outside gears to give a motion in the ratio of 1 to 2, and moving the decimal point one place to the left in the list of change gears given above, we then have in that list an index in millimeters of the threads which may be cut with these gears by different positions of the lever. For instance, if the lever is set opposite the 64-tooth gear, it will then cut a 6.4 millimeter thread, or, using the 48-tooth gear, will give a thread of 4.8 millimeters pitch, and so on through the list; the fact that the metric threads are based upon the decimal system making changes a matter of relatively great simplicity.

In arranging this lathe the standard threads recommended by the "Societe D'Encouragement pour L'Industrie Nationale" has been adopted, and its capacity also includes practically all of those threads used by the French marine and other prominent shops throughout France and other countries using the metric system. Of course, other change gears are readily placed at the end of the lathe to give any desired additional or special threads.

The other well-known features of the Hendey-Norton lathe, such as automatic stop of the carriage, reverse feed motion either in feeding or screw-cutting from the carriage, and without reversing the spindle, are retained. It will be noticed that the lathe is not only provided with the inevitable compound rest, in deference to foreign demand, but that it is also provided with four straps and bolts by means of which our foreign brother may assure himself that the tool will be firmly held. The footstock is also modified to permit the rest slide and crank handle to pass by it and over its base, so that the rest may be used when set parallel to the shears. A full line of such lathes, which, so far as we know, are the first American lathes to be especially adapted exclusively to the metric threads, are built, including all sizes from 12 inches to 32 inches (305 to 813 millimeters) swing, and with beds from 4 to 26 feet (1,219 to 7,925 millimeters) long, by the Hendey Machine Company, Torrington, Conn.



HENDEY-NORTON METRIC LATHE.

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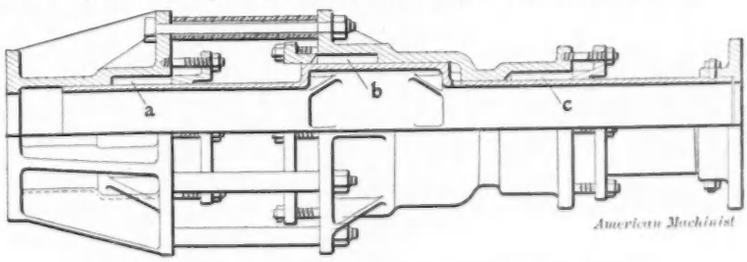
Balanced Expansion Joint for Steam Pipes.

We illustrate herewith a new expansion joint in which the arrangement is such as to avoid the effect of the pressure of the steam in the ordinary joint, by which it endeavors to force the male end out of the stuffing box. With large joints this force is very considerable and leads to heavy strains on the anchorages provided to resist it.

The appliance will be seen to have three stuffing boxes marked *a*, *b* and *c*, of which *b* is the larger, while *a* and *c* are of the same size. It will be obvious that if *b* were of the same size as *a* and *c*, the steam pressure would tend to force the male end to the right in the manner of ordinary expansion joints. The diameter of the box *b* being, however, larger than that of *a* and *c*, the effect of the pressure upon the annular bottom of *b* is to offset this tendency, and if the area of the annular bottom of *b* be equal to that of the full diameter of *a* and *c* exact equilibrium will be secured, while the freedom of the pipe to lengthen or shorten is not interfered with. Of course there are many ship joints which need to be only simple affairs, but this one would prevent such accidents as that on the "Brandenberg."

The device is the invention of Mr. S. N. Smith, general superintendent of the Newport News Shipbuilding & Dry Dock Co., and was designed originally for use on the ships turned out by that company. It is being placed on the market by H. B. Underwood & Co., of 1025 Hamilton street, Philadelphia.



BALANCED EXPANSION JOINT FOR STEAM PIPES.

Letters from Practical Men.

The Draftsman and the Shop.

Editor American Machinist:

The draftsman is a useful animal. He is also an intelligent animal, for he does a great many tricks. He can draw straight lines with a rule, also circles. That is to say, he draws circles, but not with a rule. His most astounding trick is his catching. He catches anything and everything that is flying about. He catches it always; he cannot help catching it. There is one exception though, he seldom or never catches a big salary. It is quite amusing to see him perform his catching act when the superintendent's wife has been asking for a sealskin cape, or when the general manager has been losing at poker, or when the salesman sold a universal milling machine for the purpose of turning lead screws, or a 60-inch planer for polishing steel balls. "What in Texas is that milling machine called universal for, if it cannot do such a simple, everyday job as turning lead screws?" and "if that 60-inch planer is not heavy enough to polish steel balls, why in Florida didn't they make it heavy enough?"

Let me give you an instance of the draftsman's wonderful catching powers. The other day, the first of a lot of lathebeds for a new lathe, came out of the foundry. The machinist was not able to plane it to dimensions by a yard or two. How the draftsman was to blame for this I am not quite able to see, but this may be because I am a draftsman myself. Fact is, the thing looked more like a corkscrew than like anything else. The reason for this was that the molder had been kicking away the sand at one end of the bed while his helper was pouring in metal at the other. But the superintendent was not fool enough to stop and ask for reasons. He straightway went for the man who had committed the design and gave him Louisiana.

When he got short of breath, the draftsman took the opportunity to tell him he did not make the casting, that he was perfectly willing to make the drawing according to the casting, but that as the drawing had been made first, it was but reasonable to expect the shop to make the casting as the drawing told them to do.

The superintendent muttered something like "O, Georgia," and "theory," and went to hunt for trouble in the pattern shop, but the pattern maker got the pattern and showed him there was as much finish as on other patterns, and also told him of his suspicion that the molder was to blame and how. The foreman molder said it was nothing of the kind; it was bad distribution of metal; that's what it was.

When the superintendent was gone, the said foreman took the molder who made the bed into a corner and said a few things to him in a fatherly way, and in the language best understood by the average molder. It so happened that the second bed which came out that day was as straight as the back of an Indian. But for all that, the poor draftsman has heard no end of sermons and satire about bad distribution of metal.

Some people, who don't know any better, think that the draftsman is paid to design and draw the machines. Anyone with even ever so little shop practice knows better. It is true he makes the drawings, but the designing of a machine is a very complicated affair. The president of the company does the real designing; then comes the superintendent, or the general manager, or the secretary, or the treasurer, or the cashier, or the office boy, or any other big boss, and does it over again. Sometimes all of them do it. Each of the foremen designs the greater part of the same machine, and there is not an apprentice boy in the shop who did not design at least one oil hole. All agree, however, that the draftsman did his part; he made the mistakes.

According to the popular idea, at least in the shop, the draftsman is always chock full of theory. He may have spent the greater part of his life in the shop, he may know how to chip, and file, and hammer, and work the shipper lever, he may be an expert in the gentle art of getting dirty, it's no use; as soon as he enters the drawing room, he becomes a solid chunk of theory, and bad theory at that.

It makes a draftsman feel mighty small indeed to hear some foreman say, as he looks at the drawing board: "Yes, I guess this works all right on paper, but wait till we get it in cold iron and steel." Some weeks after, the machine is finished, and the draftsman says to the foreman: "It seems cold iron and steel work just as well." The foreman says: "Say, do you know you forgot to show an oil hole in here? I had to take the whole business apart again to get one in; don't you think yourself there ought to be one? You fellows are all right when it comes to theory, but it is easy to see you don't know much about practice. Drawing is a mighty nice trade though; I used to do some drawing myself, but I never could shade my circles to make them look right. You make them very pretty; I noticed that the other day when I was looking at your board." This is supposed to make the draftsman feel good again.

It is not so generally known that in most shops, the draftsman is like a front parlor; you've got to have one because your neighbor has got one, not because you want to use it. Though the draftsman is supposed to make mistakes ex-officio, there is electricity in the air every time he makes one. I once heard of a general manager, who said on such an occasion: "You fellows draw mighty little right, except your salary." "Yes, sir," answered the draftsman, meekly, "that is because there is so little of it." Whatever the draftsman does not get, he certainly gets his full share of the kicking. The machinist kicks when the piece is hard to plane, the blacksmith kicks when he has some outlandish shape to forge, the molder kicks when the casting is difficult to mold, the manager kicks when the machine is hard to sell, and I even heard a pattern maker kick because he had to make a small pattern for three-part flask molding, and he could not saw his block on the bandsaw so as to get the parting for his pattern. And they all kick against the draftsman. What do you think would happen to the draftsman who kicked because a certain machine was hard to draw? But then no use of trying to solve this conundrum; such a thing never has happened, and I presume it never will.

Besides being useful and intelligent, the draftsman is also ornamental. I never had any idea I was until I came to the drawing room. It is a great pleasure to know one is ornamental. I don't know how I would look on the mantel-piece, but I know I look mighty well in a drawing room. For about seven or eight hours at the most, the draftsman is kept in the drawing room to work. After that his capacity for work is gone; everybody knows this; nobody ever denied it that I know of. Still he is kept for two or three hours more in the same place, to delight the eye of the manager, and to fill his heart with pride.

Some draftsmen can't stand being purely ornamental for two or three hours every day. They'll busy themselves making pencil scratches, calling them mechanical drawings, during the time they ought to have been looking pretty. However, this is not as harmful as it must seem, as it does not take more than half an hour next morning to rub them out again.

If, after reading the foregoing, some young fellow feels he ought to be a draftsman too, let him read further before he goes out as designer, for I am going to tell him what a draftsman is supposed to know. Of course, he ought to know what every civilized man should know: Three *R's*, history, geography, anatomy, logic, political economy, geology, mineralogy and the doxology. And, of course, he understands drawing in all its branches. It really goes without saying that he is a first-class mathematician, who keeps enough formulæ in store to knock any professor in that science silly. That he is thoroughly posted in theoretical, analytical and applied mechanics is understood beforehand. The same with physics, and especially electricity. Besides these branches, there are a few other things he ought to know if he expects to get or keep a place.

He must be a first-class, experienced lathe hand, and planer hand, shaper hand, and milling machine hand, and gear-cutter and general millwright, and vise hand, and

steam engineer, and practical electrician, and he must be thoroughly familiar with pattern making, and molding, and blacksmithing, and, O yes, I almost forgot, of course he must know all about pipe fitting, and boiler making, and metallurgy, and ball bearings, and any other old thing that may come handy in a shop. I also almost forgot to say that he must have a vast amount of inventive ability, and must carry all possible mechanical movements at his fingers ends. If he is found wanting in any of these things he is no good, and is sure to get into trouble some day.

As to his morals, he must be sober and industrious, and modest; keeping well in the background whenever a big boss comes around with a visitor, and explains the working of the new machine the draftsman has on his board. He must not even wince when the big boss makes a mess of it. He must be ambitious, but not too ambitious, for he must be satisfied with his salary and his position. You understand he ought to possess all the common Christian virtues. Only he should not always be truthful when one of the big bosses has a scheme to get around some snag and asks the draftsman what he thinks of it.

I am sorry to say I know several draftsmen who are found wanting in one or more of these mental and moral requirements.

DRAFTSMAN.

▲ ▲ ▲

Binding and Indexing the "American Machinist."

Editor American Machinist:

I have read your editorial in the "American Machinist" of September 2, 1897, in regard to binding into volumes and preserving the back numbers of your paper. For the past ten years or so it has been the regular practice in the drafting department of the Brown & Sharpe Manufacturing Company to do this. Older volumes have also been secured and bound, so as to complete the set almost from the first publication of the paper. They are kept in a case in the drafting room, handy for reference by the draftsmen, designers and others likely to need them.

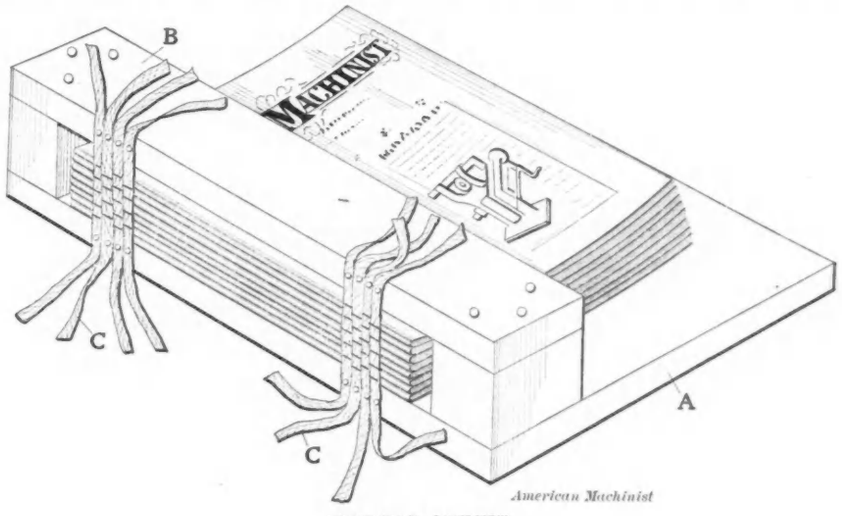
It has not been considered necessary to go to much expense in binding these papers, the method being simple, and the office boy doing all the work in his spare moments.

It may be interesting to your readers to know how it is done, and some may be encouraged to put their papers in a similar form to preserve for reference. The accompanying sketch shows the method used in binding. A frame is made with a bottom board *A*, a little larger than the papers. At the ends of this board are two blocks, thick enough to make the space between the bottom board, and the strip *B* across the top, greater than the thickness of any set of papers to be bound.

When a set is to be bound, strips of tape, ¼ inch wide, are nailed with small tacks to the frame, as shown at *C C;* four strips side by side near one end, and the same number near the other. Each piece of tape is allowed to extend two or three inches at either end.

A sheet of thick buff drawing paper, folded so as to form two leaves, is first placed upon the frame, and with a needle threaded with carpet linen, the paper is stitched to the tape, through the paper, over the first tape, back through the paper under the second tape, and so on until the other end is reached.

The papers are then arranged in order, and the last in date is laid in position, and the process of stitching repeated down the back of one paper and up that of the next. When they are all in place, including another sheet of drawing paper to finish off, the tacks are removed and the book is taken from the frame. The back



BINDING OUTFIT.

is then coated thickly with liquid glue; the loose ends of tape are spread out fan-shaped, and glued to the buff paper cover. The glue is allowed to dry thoroughly, thus forming a solid back, holding together the papers, the tape and the thread. A large sheet of heavy paper is then glued over the whole, forming an outside cover similar to that of an ordinary book. Trimming to size completes the work. This forms a binding durable enough for all ordinary usage.

When bound in this way, the papers cannot get out of their proper order, and can be referred to readily at any time. With the present size of the "American Machinist," it is convenient to bind into volumes of four months each, although the papers for six months would not make a volume out of proportion.

The indexes are also bound together, arranged by consecutive years. A better system of keeping the indexes would be the one suggested in the issue of February 25, 1897; but this requires two copies of the index, and involves some more labor.

The date of each bound volume is put on the cover with Dennison's gummed figures, which are neat in appearance and cheap. These same figures and letters are used in the drafting room for making headings for lists, and in many other places, such as making notices and signs to be blueprinted. Their use makes quite a saving over the regular method used by draftsmen of laying out block letters. They come out clearly in blueprints made from drawings where they are used.

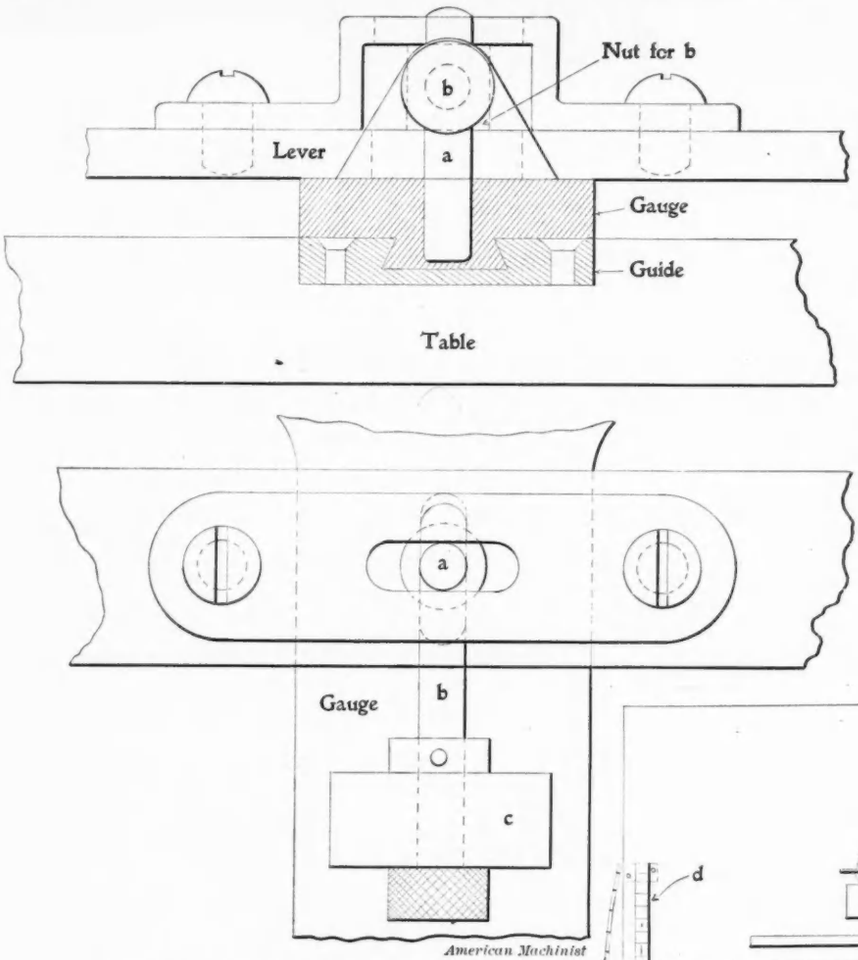
Another method used in the drafting department of the Brown & Sharpe Manufacturing Company to increase the usefulness of back numbers of technical papers is by the use of "Todd's Index Rerum" system, by which a carefully kept index is made of all articles or items bearing directly on the business and on the arts in which the company is interested.

The "Index Rerum" is a vowel index, each entry being made under its initial letter, and the first succeeding vowel, thus giving five divisions to each letter of the alphabet and making an index with five times as many subdivisions as when the initial letter only is used; thus "Grinding Machine" would be entered on the page headed "G-i," as "G" is the initial letter and "i" is the first succeeding vowel. The use of this condensed index makes it unnecessary, in most cases, to refer to the general index of the volumes containing the article wanted. There are besides many items recorded in the "Index Rerum" which are not found in the regular index.

The vowel system of indexing is also used for filing sketches of gears and similar work received from customers, which are of all shapes, sizes and kinds. They are kept alphabetically arranged in folios in a case made for the purpose. These folios are made of heavy drawing paper, and are open at two edges. They are marked, on the outside, "A-a," "A-e," "A-i," etc., thus classifying the sketches into about 130 divisions.

L. D. BURLINGAME.

Providence, R. I.



DETAILS OF GAGE FOR SAW TABLE.

intermediate shaft below, I have two speeds for feed, viz., 120 feet per minute for 1-inch pine and 80 feet per minute for 2-inch hardwood; but I accidentally discovered that the fastest speed was not too fast for the saw when sawing the thickest. Hence, considerable expense can be saved by having plain pulleys, proportioned for the fastest speed.

The feed disk measures 5 inches outside diameter, with twenty teeth, cut to give plenty of strength at the points. It is raised or lowered by the screw *c*; suitable binders, not shown, are provided to hold in place. There is a lug cast on the frame over the center of the saw to engage the pressure spring.

Rollers in front and behind the saw are let into the table. And it was found best to set the one that led to the saw not quite at a right angle, so that the boards would hug the gage.

WM. NEWTON.

Oneonta, N. Y.

Quick-Adjusting Gage and Constant Feed for Circular Saw.

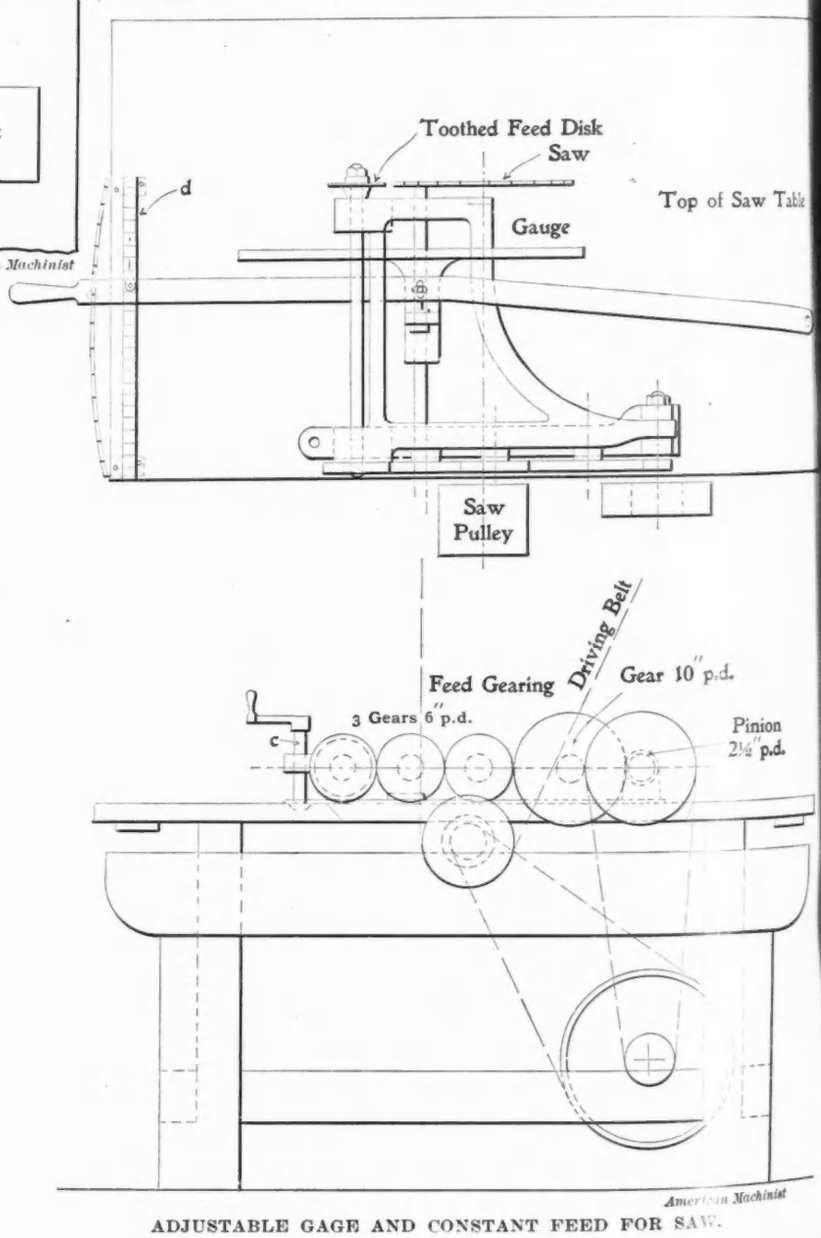
Editor American Machinist:

With this I send drawings of saw feed, which I was requested to design as an attachment to a saw already in use. It is used chiefly for sawing 1-inch boards for ceiling, also 2-inch for flooring. There is nothing new in the arrangement, with the exception of the fine adjustment device attached to the gage lever.

The "rack" at the end of the table is notched to the even measurements down to one-quarter of an inch. A strip of markings is shown on top of table, with pointer fastened to lever; it is a strip of brass let in flush with the table top, so that the workman can see the figure he wants at once, without looking at the rack, as in the course of sawing up a carload of boards it has to be changed to different widths quite often.

Should it be required to saw anything larger or smaller than the even sizes, it can be done by turning the screw *b* with the finger and thumb, the head being knurled for that purpose. *a* is a steel pin with that part enlarged that serves as a nut for *b*. The lever and its yoke are slotted longitudinally, and the tail of the gage is slotted at right angles to them.

It will be noticed that by changing the feed belt connecting the saw arbor and the



ADJUSTABLE GAGE AND CONSTANT FEED FOR SAW.

That Resolution of Censure.

Editor American Machinist:

In your issue of the 12th ult., on page 35, you state that the Parliament of Great Britain has passed a resolution of censure on the Underground Railway for adopting American traction machinery.

I really should like to know particulars as to when and under what circumstances this resolution was passed, as though watching parliamentary proceedings very closely I have no knowledge whatever of such an occurrence and do not, in short, believe that it ever happened. Your New York correspondent has probably been misled by some of the absurd reports which too many American newspaper correspondents are in the habit of cabling from this side of the water.

As regards the electric plant in question, it is, I believe, true that motors can be supplied more cheaply by American than English firms, the reason being found in the objection of the unions to machines being worked at their full capacity.

H. M. MARTIN.

London.

[It was reported and quite strongly asserted here that such a resolution had been passed, notwithstanding its manifest absurdity. We regret that the report found a place in our columns.—Ed.]

▲ ▲ ▲

That Special Mechanical Movement.

Editor American Machinist:

The device shown by "B. C. A." in your issue of September 2d would no doubt be subject to considerable twisting action of the frames carrying the gears, as you suggested in your comment, but it has occurred to me that this objectionable feature might be eliminated by duplicating the fixed screw and gears with threaded hubs, as shown in sketch herewith. The moving power would thus be applied simultaneously at both ends of each frame, which would ensure a parallel movement of the same. Of course, the number of gears would add to the expense, but the new gears are all duplicates of the original ones.

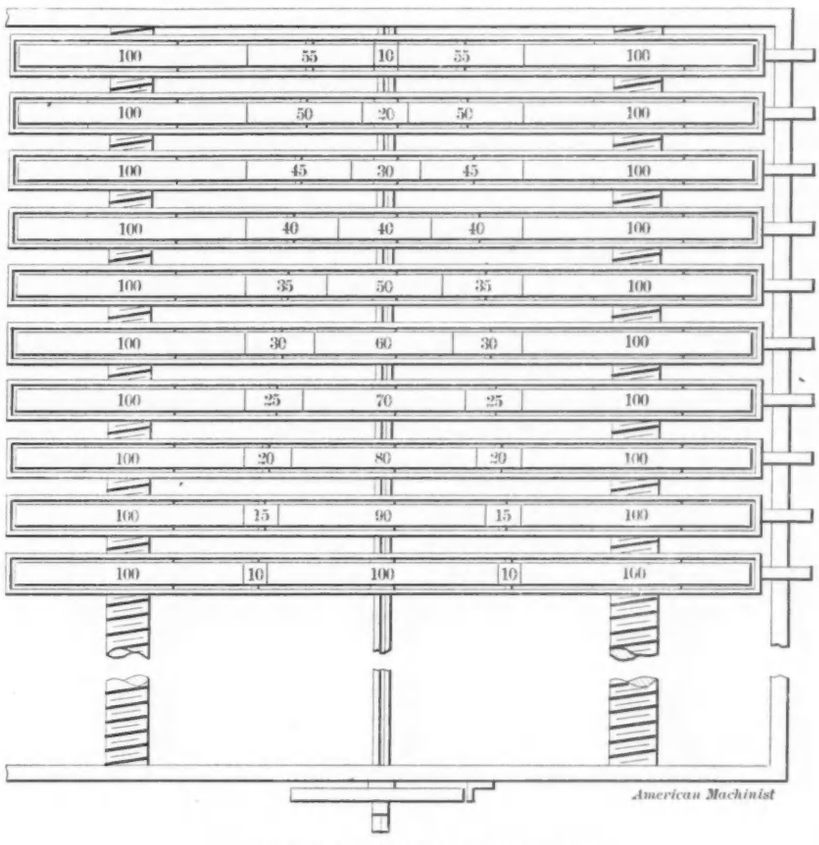
The gears on the splined shaft are the only ones that need to be especially accurate, any inaccuracy in the rest of the gears having no effect on the accuracy of spacing between the pins; but in order to accomplish this end, the gears would have to be cut in pairs, corresponding teeth in each marked, and the machine so assembled that these marked teeth would be in mesh at the same time. Also, the sides of the gears that were together in the gear cutting machine would have to face in opposite directions after assembling.

This device ought to appeal strongly to Messrs. Randol, Bilgram, Foster and others who advocates screws of the same hand to raise a planer rail, as that principle is involved here, not as a matter of choice, however, of necessity.

WALTER GRIBBEN.

Brooklyn, N. Y.

[The apparent simplicity of a mechanical task does not necessarily imply that simple means exist or are easily found for its accomplishment. None of the devices sugested for the movement of the pins can be considered practically satisfactory, or at all comparable with the lazy-tongs for the purpose. Unless some strikingly original or satisfactorily simple solution is offered it will probably be well to reserve our space for other matter hereafter.—Ed.]



SPECIAL MECHANICAL MOVEMENT.

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A New Welding Compound.

The following is from the specification of a recently issued patent. "Restoring the life to metal which may have been burned," we have heard of before, but it is always better not to murder the metal. Whether the mixture described has any virtue as a welding compound, can, of course, be best determined by trial. The compound is sufficiently described by the following extract:

"By the use of my compound a weld may be produced with a heat of any degree, from a low red heat to a high white heat. The compound acts as a flux to produce an adhesion, which, when the metal is hammered, becomes a firm weld, and at the same time the life is restored to any part of the metal which may have been burned.

"The compound is composed of an intimate mixture of common sand, ground marble, borax, common salt and powdered charcoal, in about the proportions hereinafter named: Common sand, 32 per cent.; ground marble, 50 per cent.; borax, 12 per cent.; common salt, 4 per cent.; powdered charcoal, 2 per cent. The above proportions are not essential, but may be varied within reasonable limits as desired. The mixture is effected in any suitable preferred manner.

"It has been found in practice that a weld may be produced with the aid of the above compound with more ease, more simplicity, and with a lower heat than by any other process or with the aid of any other compound known to me, and that a better adhesion, and consequently a firmer weld is produced."

The patentee is Thomas Odlum, Richmond, Va.

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At the next regular meeting of the Western Railway Club, which will be held September 21st in the Auditorium Hotel, Chicago, a paper entitled "How Can Shop Organization Be Made More Efficient?" by Mr. L. L. Smith, and one entitled "Machine Tools From Another Point of View," by J. W. Gardner, will be presented.

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Monitors for the Navy.

Our readers will remember a recent editorial of ours in which the monitor type of vessel was referred to as being, in our opinion, best suited to the needs of the American Navy. We are in receipt of a pamphlet entitled "Reconstructed American Monitors," by Passed Assistant Engineer F. M. Bennett, which is reprinted from the "Journal of the American Society of Naval Engineers," and which we are glad to see is an endorsement of the monitor.

After referring to the opposition by the naval authorities which this invention had to meet when new, the pamphlet goes on to give a short history of the recent monitors, and then proceeds to give the author's experience on board one of them—the Amphitrite—when doing the duty of a cruiser. Very inadequate attention was given to the question of ventilation in the design and construction of the Amphitrite, resulting in a condition of things which it is using mild language to call disgraceful. The first trip with battle hatches and superstructure doors closed to keep the seas out, brought up the question of internal temperatures in a very painful manner. With outside temperatures of 50 to 72 degrees, the engine-room temperatures ranged from 120 to 140, while in the fire-room the figures became 140 to 160. As the weather became warmer the thermometer on the working platform mounted to 138 to 158, and in the fire-room to 157 to 170. Worse yet, these temperatures in the fire-room ruined the draft and filled the fire-room with smoke. Over the boiler the temperature became 202 degrees, and it became impossible for the men to reach the stop-valves. Under these circumstances the crew rapidly collapsed, until the engines actually stopped for want of steam. The description of the last day of the trip is deserving of reproduction here:

"The scene in the fire-room that morning was not of this earth, and far beyond description. The heat was almost destructive to life; steam was blowing from many defective joints and water columns; tools, ladders, doors and all fittings were too hot to touch, and the place was dense with smoke escaping from furnace doors, for there was absolutely no draft. The men collected to build up the fires were the best of those remaining fit for duty, but they were worn out physically, were nervous, apprehensive and dispirited. Rough Irish firemen, who would stand in a fair fight until killed in their tracks, were crying like children and begging to be allowed to go on deck, so completely were they unnerved and unmanned by the cruel ordeal they had endured so long. 'Hell afloat' is a nautical figure of speech often idly used, but then we saw it."

The remedy for this state of things, the effect of which is described as "remarkable," consisted in putting four large ventilators into the fire-room, two into the engine-room, altering the ash hoist tube and changing the intake of the engine-room blowers, which had been previously arranged to collect the hot air discharged from the hatch and send it back again! an arrangement which the author aptly describes by calling it a regenerator.

After such an experience as this, the author could be pardoned if he felt somewhat prejudiced against monitors; but instead of indulging in such thoughts he concludes his paper in the following words:

"Though lacking in many of the comforts usually found in other classes of ships, the monitor can be made an agreeable habitation for officers and men, and, which is of more importance, it can be made to work successfully. The cost of operating and the number of the crew required are small in comparison with the possible destructive and defensive results that may be achieved, and the first cost is also small when measured by the same standard. No other type of war vessel is so essentially American or so essential to the maintenance of our defensive naval policy."

Perhaps the fact that the author is an engineer, and not a sailor, accounts for the fact that he subordinates all other qualities in a fighting ship to the ability to fight.

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Speed Trials.

On the recent trial, not the first, to get the torpedo boat Rodgers to reach the contract speed of 24½ knots, a general breakage and derangement of the machinery occurred, and five men were seriously injured, a chief engineer of the navy being the most prominent victim. As reported, the after crank shaft of the port engine first broke, and then a general smash up followed. The shaft was broken in three places, all four of the connecting rods were bent, the holding down bolts were broken, two cylinder heads were ruptured, a steam pipe was broken off and the men were frightfully scalded. At best two months will be required to make the repairs, and then we may suppose another trial may be had.

It may be worth while to inquire why such trials are held. The practice of testing the speed of each individual addition to the United States Navy, as conducted, seems to be an utterly absurd and senseless, as we know it to be also a dangerous one. When on these occasions speed is strained for, it seems to make no difference how or by what means the speed may be attained, or how completely every condition of safety may be ignored. The trials are too suggestive of the bursting of a steam boiler to know precisely how much pressure it will stand. They are made under absolutely exceptional and impracticable conditions; they endanger life and they prove nothing. Although the results attained go on the record, they are of no value. The national self congratulation and brag too often evoked by them might have a more substantial basis or might more properly be withheld. It is notorious that comparatively little can be predicted from the trial performance as to what will be the speed of any ship in actual service, except that it will never be nearly approached again. The trial, if it shows anything, shows rather what the vessel in service will not do than what it will do.

But why should there be a contractor's speed trial at all? As the designs for the ships either originate with the Navy Department or must be approved by it in every detail before a contract is awarded, the responsibility for the performance must also belong to it. Nothing, in the nature of the case can properly be demanded of the builder but good materials and good workmanship, and this should

be secured by thorough and competent inspection. Speed trials do not prove the honesty or efficiency of the builder as such. Not until a vessel is actually in commission can any reliable speed trial occur, and the results then obtained should be of value to the Navy Department, but they should not necessarily be the property of all the world.

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A Legal Decision Upon a Fly-Wheel Accident.

It will be remembered by our readers that more than a year ago a heavy fly-wheel burst in an electric power station at Albany, N. Y., doing considerable damage. One piece of the wheel flew across the street and killed a man. The widow sued for damages and the judgment in her favor has lately been reversed by the Court of Appeals. The final decision assumes that the accident was due to an error of judgment on the part of the engineer rather than to negligence. It appeared in the evidence that the engineer when he noticed that the engine was overloaded first cut off the current, expecting that the governor would take care of the engine, and before he could close the throttle the accident occurred. The learned judge said that "the evidence was not, even upon the assumption that the engineer made a mistake in breaking the current before he shut off the steam, sufficient proof of negligence to charge his employer with responsibility for the death of the intestate, it appearing that the engineer acted promptly in the premises and used his best judgment." It may be expected in consequence that power companies will be looking for engineers with treacherous judgments.

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Personal.

We will consider it as a favor if our readers will send in items of news regarding changes of foremen, superintendents or others prominently connected with the machine business. Such items are legitimate news of the trade, and we are glad to make room for them.

Mr. William A. Canty, formerly of the Pratt & Whitney Co., Hartford, Conn., has severed his connection with that company to take the superintendency of the screw machine department of The Davis & Egan Machine Tool Co., Cincinnati, Ohio.

Mr. M. Greenwood, for nine years superintendent of the Hall Steam Pump Company, Allegheny, Pa., has resigned to accept the position of sales agent, in Pittsburg, Pa., of the Laidlaw-Dunn-Gordon Company, Cincinnati, O., with office in the Carnegie Building.

Mr. Felix Miller, who for some time has been identified with John S. Metcalf & Co., of Chicago, is on the way to Manchester, England, where the company named above will erect a grain elevator of 1,500,000 bushels capacity. An interesting fact regarding this elevator is, that not only will it be erected by this Chicago firm, but that all the material, including timber, nails, etc., will be taken over from America.

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Obituary.

Mr. Alanson Cary, who for many years has been prominently identified with wire and spring manufacture, and has been the inventor of many improvements in that line, died at his home in this city on the 17th inst. of a stroke of apoplexy. Mr. Cary was born in 1827, and at 15 years of age invented a machine for carving ivory, which was patented and sold to a manufacturing establishment. He was afterwards connected with Washburn & Moen, of Worcester, Mass., but for some years past had been connected with the establishment of Cary & Moen, spring manufacturers in this city.

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Technical Books.

MODEL OF A LOCOMOTIVE, WITH A HISTORICAL SKETCH AND BRIEF DESCRIPTION OF THE WORKING PARTS. By Christopher Volkert. 14 9½ x 13-inch pages and a folding paper model. Geo. Philip & Son, London. Price four shillings and sixpence.

This is an ingeniously contrived scheme for giving elementary instruction in locomotive construction. The "model" is a series of pictures placed one over the other. The first shows a side elevation and on this being turned back sections are disclosed. The working parts, cylinder, cross-heads, main bearings, etc., are shown in the same way in successive sections. Prefaced to this is a historical sketch giving the main features of what must always be a leading and engrossing chapter of the world's history—the story of the origin and progress of the iron horse.

BROWN'S "DISCIPLINE OF RAILROAD EMPLOYES WITHOUT SUSPENSION." By G. F. Brown, General Superintendent Fall Brook Railroad. J. S. Koehl & Co., Easton, Pa.

This is a small book giving full particulars regarding a system of maintaining discipline on railroads, which was originated by Mr. Brown, and used successfully by him for some years, and has recently been adopted by a great many other roads with very favorable results. Not only does this system, which has come to be known by its originator's name, secure a much better feeling toward railroad companies by their employés, but it has also been demonstrated that it results in much economy of operating, that is, that it reduces the operating expenses. It also does away entirely with the injustice inevitably connected with the practice of suspensions for mistakes and transgressions of rules made by railway employés, and, in short, is a system of management which is based upon reason and which takes advantage of well known and universal traits of human nature. The book is supplied at the price of 17 cents, and all who are interested in the management of industrial operations, whether railroad or other, should read and study it.

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On Saturday, September 11th, the 550 employés of the Davis & Egan Machine Tool Company, of Cincinnati, O., with their families, were given an outing by the company named, in the form of a holiday with full pay, in additon to which tickets were supplied to various places of entertainment at the amusement resort known as the Lagoon. The various foremen were tendered a dinner at the Club House, and prizes were given by the company to the winners in various contests, which included bowling, foot-racing, etc.

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In giving a list of names and addresses of the officers of the Society for the Promotion of Engineering Education in our issue of September 9th we should have given the name and address of the secretary as Prof. Albert Kingsbury, New Hampshire College, Durham, N. H.

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Questions and Answers.

Name and address of writer must accompany every question. Questions must pertain to our specialties and be of general interest. We cannot undertake to answer questions by mail.

(140) F. W. T., North Cambridge, Mass., asks, why are tail-stock spindle screws made left hand in iron-working lathes, and right hand in wood-working lathes? Inquiry of manufacturers' agents brings no information, and writing direct to manufacturers brings catalogs, but no statement on the case. There are exceptions to the practice given above, but I think it is largely true in this part of the country? A.—So far as we know, there is no reason for this variation. It is only a case of happening so.

(141) "Ideal," New York, asks: Will you give directions for setting the piston valves of an "Ideal" engine? A.—The "Ideal" engine is made by two companies, A. L. Ide & Sons and the Harrisburg Foundry & Machine Company. From both of these we have information to the effect that they provide for the valve-setting operation by the following method, which is given in a publication of the first named company: "Should you wish to ascertain if the steam valve is properly set, proceed as follows: Take off the cover or elbow on outer end of steam chest, so you can have access to end of valve. Turn the engine over until the valve has traveled as far as it will go toward the end of steam chest. Then measure from the end of steam chest to the end of the valve, and this distance should be represented by the figures in inches and fraction, stamped on end of steam chest. If measures do not agree, set valve by screwing the valve stem at the ball joint."

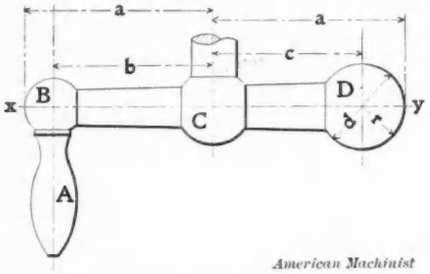
(142) R. & B., Dover, N. J., write: We have a stand pipe tank, 100 feet high, 15 feet in diameter, and we wish to know which plan of filling this will cause the least loss by friction—that is, to run a pipe 3 inches diameter to the full hight of the stand pipe and discharging at the top, or to pump the water into the tank 2 feet

from the bottom. A.—The plan of pumping to the top through the 3-inch pipe will cause most frictional loss; such loss increasing with decreased diameter of pipe where the same quantity of water is delivered. A more serious loss by the pipe arrangement might be, however, from the fact that by it water pumped into the tank must all be raised to the maximum hight of 100 feet, whereas by pumping into the bottom, the head pumped against is never greater than the actual hight of the water in the stand pipe. 2. What pressure will we get by the 100-foot head? For each foot in hight you will get a pressure of .433 pounds, and for 100 feet you will get 43.3 pounds pressure. 3. What will be the amount of water in the stand pipe in gallons? A.—132,100.

(143) C. V. F., Stanton, Ia., asks: Can you tell me why lead or tin is put into journal brasses after they are finished? I have seen new brasses lined with lead, and would like to know why this is done. A.—It is done because it is found that, for some service and under certain conditions, this lead gives the best results. It is quite largely used for car journals, which, however, is a service differing essentially from that of any other journal. 2. What is the best way to harden and soften a finished journal brass? A.—We know of no practical way of hardening such a brass. Brass can ordinarily be hardened only by great pressure, such as that given by a drop hammer or by the drawing process, and this, of course, is not practicable in the case of a journal brass. Brass can be softened by heating to a low heat and plunging in water. 3. Which is the proper side of a belt to run on a pulley, the hair or flesh side. A.—We believe the hair side is the one to be run on the pulley. 4. What kind of pulley arms are the best on cast wheels, straight or curved? A.—Straight arms are now the fashion, and pulleys with curved arms are no longer made by those who profess to be up with the times. 5. What is the average steam pressure locomotives use here in the United States? A.—We do not know. Pressures range from 100 to over 200 pounds.

(144) C. H. F., Milford, Mass., writes: I wish to bring soft spring water, for household use, 3,000 feet, under 175-foot head. What kind of pipe can be used, that the water may be pure and the pipe durable? What solvent will remove the soft, pasty iron rust which has partly filled a 1-inch plain wrought-iron pipe now laid? A.—For the following answer we are indebted to Prof. O. H. Landreth, Union College, Schenectady, N. Y., an acknowledged authority upon water supply and transmission: "(1) If the pipe is to be laid deep enough in the ground to be permanently wet, as it probably will be, to place it below frost line, bored wooden pipe would meet the requirements; but under the head stated, the thickness of shell necessary would probably make the cost in excess of properly prepared iron pipe. Galvanized wrought-iron pipe will resist corrosion well for a time, but ultimately will succumb to the action of the oxidation under the thin coating of zinc. Plain black wrought-iron pipe, thoroughly coated inside (and preferably also outside) with a preparation of coal-tar pitch and asphalt, such as is used to coat cast-iron water pipes, will not be affected by soft water if the coating is well done. For the length needed, probably any of the manufacturers of wrought-iron pipe would take a special order for the asphalt coating. (2) There is probably no solvent within reach, financially, that would start the rust coating without corroding the shell of the pipe in places before the rust was removed in others. Kerosene would probably loosen and disintegrate the rust, but there is doubt as to whether there would be enough erosion in the running stream of water afterwards to remove the loosened rust; nothing short of a trial will tell. The kerosene may be introduced by draining the pipe for several hours and then running in a few gallons of kerosene, then allowing the pipe to fill very slowly with water—from the lower end, if possible—which will float the kerosene slowly through the entire length. The water should be admitted very slowly, not faster than 4 or 5 gallons per hour. If rapid flushing of the pipe with the full head of water afterward brings out loosened rust, one or more repetitions of the treatment would be warranted."

(145) W. S. S., Springfield, Mass., says: I wish help in the solution of the following problem: The weight of handle A known; the sizes of balls B and C known; what should be size of ball D to just balance A and B? The length $cx = cy$. A.—The ball as a balance acts at its center of gravity, but the location of this center of gravity depends on the size of the ball, as the over-all radius is fixed. In other words, the diameter of the ball is a function of itself, and it is to be expected that the resulting equation will be in such form as to be capable of solution only by successive approximation. Let the combined weight of the handle A and ball B



be W. Then the weight w of ball D acting at radius c will be

$$w = W\frac{b}{c}$$

also $w = d^3 \times .5236 \times$ constant for weight;

from which $d = \sqrt[3]{\dfrac{w}{.5236 \times c}}$

and $r = \frac{1}{2}\sqrt[3]{\dfrac{w}{.5236 \times c}}$

$$c = a - r$$

$$= a - \frac{1}{2}\sqrt[3]{\frac{w}{.5236 \times c}}$$

whence $w = \dfrac{Wb}{a - \frac{1}{2}\sqrt[3]{\dfrac{w}{.5236 \times c}}}$

We do not regard such problems as profitable. Practically they are solved by experiment. Even if worked out by this equation, the resulting handle would not balance, as the unequal weights of the two ends of the cross-bar are not taken into account.

(146) H. B. S., Cleveland, asks: In the French or metric system of screw threads, the size of the thread is designated by the pitch of the single thread, instead of using some number, usually a whole number, of threads to the inch as we do. Is not the French system less convenient than our own, when it comes to figuring the screw gears for an engine lathe, and how do they do it, anyway? A.—The metric system of thread designation is fully as convenient as our own in this respect. With us we usually have two or three stud gears, with large differences in the numbers of their teeth, and most of the changes for the different threads are made in the screw gears. Thus with a lead screw five to the inch, and with the stud turning at the same speed as the spindle, a set of gears running as follows might be used:

Number of Threads.	Stud.	Screw.
2	80	32
3	80	48
4	80	64
5	80	80
6	80	96
7	40	56
8	40	64
9	40	72
10	40	80
11	40	88
11½	20	46
12	20	48
13	20	52
14	20	56
16	20	64
18	20	72
20	20	80
24	20	96

Number of gears to the set, 12.

For cutting metric threads a screw with a pitch of 5 millimeters would be quite convenient for a small engine lathe, and that pitch would also be quite nearly the same as our 5 to the inch. A convenient set of change gears for the common metric threads would then be as follows:

Pitch of Thread, Millimeters.	Stud.	Screw.
1	20	100
1.5	30	100
2	40	100
2.5	50	100
3	60	100
3.5	70	100
4	80	100
4.5	90	100
5	50	50
5.5	55	50
6	60	50
6.5	65	50
7	70	50
7.5	75	50
8	80	50

Number of gears to the set, 13.

The first thread is here at the top of the list, while in the American system it is at the bottom. One millimeter pitch is about 25 to the inch and is used for 6 millimeters diameter, which is a little less than a quarter of an inch. Eight millimeters pitch is a little over 3 to the inch, and is used for 96 millimeters diameter, or about 3¾ inches. The stud gears in the above list are obtained, for the upper half of it, by multiplying the pitch by 20, and for the lower half by multiplying by 10.

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American News in France via England.

["Morning Post" Cablegram.]

New York, May 28th.—Renewed depression, following the slight revival that accompanied President McKinley's accession, is beginning to cause violent outbreaks among the unemployed. At Altoona, Pa., 400 men have been thrown out of work at the Westinghouse Locomotive

Works. They have pulled down the factory walls—it is called McKinley's factory—and jumped on it amid scenes of wild excitement.—Paris edition "New York Herald."

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The Metropolitan Traction Company, of New York, is to have a power-house with a total capacity of 70,000 horse-power—the greatest in the world, up to date. This enormous power will not, after all, equal that of three of the largest ocean liners.

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The Acme Malleable Iron Works, Buffalo, N. Y., has erected a building entirely of iron and steel, and isolated from all other buildings, for the storage of patterns. Stoves also are made of iron, but wood placed in them burns very readily.

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The consumption of cotton in the mills of the South will this year exceed 1,000,000 bales, while in Northern mills it will not reach 2,000,000.

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Commercial Review.

NEW YORK, Saturday Evening, Sept. 18.

A GOOD MOVE IN EXPORT STATISTICS, and one that will be appreciated by tool builders, is the adoption by the United States Treasury of a new system of classifying machinery, which gives to metal working and electrical machinery, pumps, etc., separate mention. This seems to be an official recognition of the important figure now cut by machinery exports, but it is a pity that it could not have been begun by the time when, apparently, that department of trade was at its maximum. The change takes place with July, 1897, the first month of the present fiscal year, and for which month the official report has just come to hand.

The values of the various kinds of machinery then exported were as follows: Metal working, $267,286; electrical, $64,839; printing presses and parts of, $56,888; pumps and pumping machinery, $159,828; sewing machines, $254,987; shoe machinery, $54,020; fire engines, $680; locomotive engines, $167,988; stationary engines, $32,162; boilers and parts of engines, $56,759; typewriters and parts of, $108,889; all other, $927,845. From this we compute a total of $2,152,171. With this can be compared the figures $2,611,787 for June, 1897, and $2,176,162 for July, 1896, although it is possible that the comparison may be vitiated by latent irregularities, owing to the change of the system of classification.

IS THE MACHINERY TRADE REVIVING?

Reaffirmations of an increasing business throughout the country continue to flow from the commercial press. What our readers would like to know is, whether this is true of the particular lines of trade and industry in which they themselves are engaged. With a view to solving this question on a broad territorial basis we have addressed inquiries to a number of machinery builders from New Hampshire to Wisconsin, and print below the replies received.

Our deductions from these are as follows: First, that the business improvement has already appeared in the machinery market. Second, that such improvement is sure, though gradual, and will come to fruition as rapidly as external conditions justify. The reader may judge for himself of the correctness of these conclusions.

A SYMPOSIUM OF VIEWS.

From the Betts Machine Co., Wilmington, Del.: "Our business has improved considerably during the last two or three months. We are running full time and nearly full-handed—but prices are still low, and it is hard to advance them."

From Beaman & Smith, Providence, R. I.: "As yet we find no improvement so far as actual sales are concerned, but inquiries indicate a feeling of confidence and disposition to place orders which has previously been lacking in many of them."

From the Buffalo Forge Co., Buffalo, N. Y.: "There seems to be some improvement in the machinery market, so far as our lines are concerned, but it is not as yet of extensive nature. Our works at this season are invariably running full time on heating and ventilating business. This year is no exception, and, in fact, a certain amount of overtime is required to keep pace with orders. Our engine business is way ahead of any previous year. Some of our other lines show improvement, while others are about normal."

From Flather & Co., Nashua, N. H.: "We have been quite busy for a long time on export orders and have not paid as much attention to the home trade as we usually do, therefore may not be competent to judge properly whether business is improving or not. In so far as our experience goes, we have not as yet seen much change or improvement. And although the newspapers claim great advances in iron and steel, we have been offered within a few days lower prices than ever on standard brands of pig iron, bar iron and steel."

From the G. A. Gray Company, Cincinnati, O.: "If we interpret correctly, you want us to base our reply on general observations rather than on our own business. Undoubtedly, there prevails here a general tone of improvement. But simmering down much of the rather exaggerated talk about improvement, we are forced to the conviction that same is based more on anticipation that on realization. In other words, people seem to feel so confident of an ultimate material improvement, that they are inclined to risk discounting same."

From Hill, Clarke & Co., Boston, Mass.: "We find quite an improvement in our home trade over last year, and feel quite sure that it will continue for some time. We think the great strike in England, among the machinists and engineers, will cause a smaller demand from abroad. We notice that the foreign orders are not as heavy as they were in the spring."

From the Kempsmith Machine Tool Co., Milwaukee, Wis.: "There is an improvement in business so far as it relates to our factory, and we have for some time been adding to our facilities to increase our output, in anticipation of a revival in trade this fall. Our orders are now coming in quite freely. Whether this condition will hold or not, remains to be seen. We have, however, a feeling that the business we are getting is of a more permanent character than it has been during the past four years."

From the Newton Machine Tool Works, Philadelphia, Pa.: "Business with us is very much better than it has been for several years past. We would say that for the last three years, about fifty per cent. of our work has been foreign orders. The foreign business continues about the same, but the domestic orders have materially increased and with the inquiries we are now receiving, we have every reason to say that with the coming fall, we will be very busy."

From Sibley & Ware, South Bend, Ind.: "General business is very good, especially in implements, wagons and farm machinery in general and our trade has very much improved to supply this line of manufacturers."

Two replies must be made anonymous. One comes from an Eastern company and is to the effect that they have been well occupied with work all along and that possibly there may be a little gain.

The other, which is from a Western concern, is as follows: "We presume you want only a conservative view. We certainly think there is going to be an improvement in our line, although at present in domestic trade, there is not. Our foreign business has been steadily increasing, but this is no wonder, as we are just beginning to get a good foreign business." They add that domestic inquiry amounts to practically nothing.

Quotations.

NEW YORK, Monday, September 20.

Iron—American pig, tidewater delivery:

No. 1 foundry, Northern	$11 50 @ $12 00
No. 2 foundry, Northern	10 75 @ 11 00
No. 2 plain, Northern	10 50 @ 10 75
Gray forge, Northern	10 25 @ 10 50
No. 1 foundry, Southern	11 00 @ 11 25
No. 2 foundry, Southern	10 50 @ 10 75
No. 3 foundry, Southern	10 25 @ 10 50
No. 1 soft, Southern	11 00 @ 11 25
No. 2 soft, Southern	10 75 @ 11 00
Foundry forge, or No. 4, South'n	10 00 @ 10 25

Bar Iron—Base—Mill price, in carloads, on dock: Common, 1.00 @ 1.05c.; refined, 1.10 @ 1.15c. Store prices: Common, 1.25 @ 1.35c.; refined, 1.30 @ 1.45c.

Tool Steel—Ordinary sizes, standard quality, 6 @ 7c., with some grades perhaps a little less; extra grades, 11 @ 12c.; special grades, 16c. and upward.

Machinery Steel—Ordinary brands, from store, in small lots, 1.60 @ 1.70c., with .05c. further advance hourly expected.

Cold Rolled Steel Shafting—Base size, from store, in small lots, 2.15 @ 2.25c.

Copper—Carload lots, Lake Superior ingot, 11¼ @ 11⅝c.; electrolytic, 11½c.; casting copper, 11c.

Pig Lead—Carload lots, 4.32½ @ 4.35c., f.o.b., New York.

Pig Tin—For 5 and 10-ton lots, 13.80 @ 13.90c., f. o. b.

Spelter—Carload lots, New York delivery, 4.30c., with possible concessions in some quarters.

Antimony—The range, according to brand and quantity, is 7¼ @ 8¼c.

Lard Oil—Prime city, winter make, ordinary quality, in wholesale lots, 40 @ 42c.

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Manufactures.

John Chase & Son, Webster, Mass., are intending to add new machinery.

At Oolitic, Ind., John R. Walsh, of Chicago, will erect a stone sawing mill.

The plant of the Perkins Foundry Company, Amsterdam, N. Y., is to be enlarged.

(*Continued on page 37.*)

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Business Specials.

Gear wheels, gear cutting. Grant; see page 16.

Brass Cast'gs. all kinds. H. D. Phelps, Ansonia, Ct.

E. H. Randall, fine tools. See page 10, this issue.

Forming Lathes. Mer. Mach. Tool Co., Meriden, Ct.

Selden Packing for stuffing box, with or without rubber core. Randolph Brandt, 38 Cortlandt st., N. Y.

Brass ptn. letters & figs. for sweat'g on metal ptns. H. W. Knight & Son, Seneca Falls, N. Y., Drawer No. 12.

Gear and milling cutters, adjust. reamers, counterbars and tools, vert. millers, drill pr., cutter and surf. grind., shears. R. M. Clough, New Haven, Ct.

Cost of Manufacturing—Experienced manager will establish system of costs, giving exact account of every detail. Charge based on saving effected. Correspondence solicited. Geo. C. Thomas, 99 Nassau Street, New York. Room 212.

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Wants.

Situations and Help Advertisements only inserted under this head. Rate 30 cents a line for each insertion. About seven words make a line. The Cash and Copy should be sent to reach us not later than Saturday Morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Situations Wanted.

Sit. as f'dry foreman; best ref. Box 233, Am. Mach.

Pr'c to'l. & draft. w'nts work. Box 218, Am. Mach.

Machine designer wants pos. Box 190, Am. Mach

Sit. wanted by mach. and tool maker; 11 years' exp., 2 yrs as foreman; age 27. Box 231, Am. Mach.

Pos. in the State of Col. by a gen'l mach. of steady habits. Add "M.," Lock Box 68, Bainbridge, N. Y.

Mach draughtsman wants position; long exp.; good ability; moderate salary. Box 229, Am. Mach.

Situation wanted by foreman of chain dept. of bicy. factory; also tool maker. Box 225, Am. Mach.

Wanted—By a first-class mechanic and successful shop manager, situation as foreman or supt.; best of refs. Box 210, American Machinist.

Position wanted as supt. or general foreman; wide exp.; up in mod shop methods; designer of special tools and machines. Box 223, Amer. Mach.

Wanted—A pos. as manager of a well-established mach works by a practical mechanical engineer. Will take a monied interest. Ad Box 222, Am. Mach.

Young, mechanical draftsman, with tech. education, wants situation; 3½ years drawing room experience and five years as an all-around machinist; steady work and chance to gain more exp. a greater object than high wages. Add. Box 228, Am. Mach.

Mech. and civ. eng. first-class draftsman, speaks Eng., Fr., Ger., Hung., etc., large exp. in all kinds of agric. mach., and spec. oil eng. work; at present empl. in prom. harv. wks. as drfts. & constr. eng., wants to chg. pos. Would work as drfts. in fact. or pat. office, do constr. work in shop or trav. anywhere to put up & start machs. Box 234, Am. Mach.

I want a permanent engagement where mechanical and electrical engineering of practical value will be appreciated. Will design and construct complete plants for manufacturing paper, asbestos, electricity, or for wood working, or will contract to work out and improve details of existing plants and processes, in which my experience is considerable. Have also supervised the building of railway trestles, docks and steamboats for the U. S. government, and designed for the War Department boilers, steam machinery and other appliances. Can handle men and material to advantage, and keep the cost of labor within the estimate. Address James F. Hobart, 230 Eleventh St., Brooklyn, N. Y.

Help Wanted.

Wanted—Five first-class all-around machinists. Work will probably last through the Winter at least. Gifford Bros., Hudson, N. Y.

Wanted—A competent manager to take charge of machine shop employing 80 to 100 men; must take a monied interest. Address Box 227, American Machinist.

Wanted—Two first-class tool makers. Wages $3.00 per day. Must be thoroughly competent, and furnish reference from former employer. Address Williamsport Staple Company, Williamsport, Pa.

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Miscellaneous Wants.

Advertisements will be inserted under this head at 30 cents per line, each insertion. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Cheap 2d h'd lathes & planers. S. M. York, Clev'd, O.

Calipers & Gauges. F. A. Welles, Milwaukee, Wis.

The Dutton Wet Twist Drill-Grinder is sold by the Garvin Machine Co., New York City.

Best and cheapest Bolt Header, made by Baush & Harris Machine Tool Co., Springfield, Mass.

Light and fine mach'y to order; models and electrical work specialty. E. O. Chase, Newark, N. J.

For Sale—Second-hand drill presses, engine lathes & planers. Dietz, Schumacher & Boye, Cincinnati, O.

Exp. machinist, with capital, would like to take part interest in repair shop. Box 224, Amer. Mach.

For Sale—Machine shop and foundry, $10,000 cash, balance on easy installments; good reason. Box 220, care Machinist.

Patent right, special tools and machines for sale; good article to manufacture with other machinery. Box 226, American Machinist.

We make a specialty of Shartle's patent safety set collars. Prices low and samples free. Middletown Machine Co., Middletown, Ohio.

For Sale—Small machine shop, having good repair trade, in town of 1 400 inhabitants; no opposition. Box 232, American Machinist.

Model Locomotives—Complete castings, latest N. Y. Cen. standard, up to date; 4c. in stamps for cat. alog. G. H. Olney, 163 Herkimer St., Brooklyn, N. Y.

Lathes, planers, drills, milling machines, vises, also brass working machinery second-hand; must be modern and in first-class condition. C. C. Wormer Machinery Co., Detroit, Mich.

For Sale—6 lathes, 2 boring mills, 1 planer, 4 drill presses, 3 emery wheel stands, shafting, pulleys, hangers, chain blocks, vises, drills, etc. all in good order. Address Box 853 Cincinnati, Ohio.

For Sale—Gasoline and gas engine plant, one of the oldest manufactories of gasoline engines in this country; over 700 engines in operation; will bear investigation; good reasons for selling. Address Box 205, care of American Machinist.

A prac. mach and draftsman, with a good line machinery to build, some money and several years business experience, would like to meet two or more machinists with about $2.500 each to join me in starting a business. Address Box 230, Amer. Mach.

I would like to find a good man to join me in taking a lease of a well established factory engaged in the manufacture of engines and boilers. Must be a practical man, competent to assume the duties of supt. A certain amount of capital desirable, but not absolutely necessary. Box 221, Amer. Mach.

A Rare Opportunity—For Sale—A mfg. plant in Brooklyn, N. Y., conveniently situated to ferries and shipping points. Equipped with 50 H. P. engine and 80 H. P. boiler, power hoist, main shaft ready to operate, steam heated. Ground 132ft. x 200ft., main buildings 132 ft. x 32ft. and 124ft. x 71ft., also a number of outbuildings suitable for storage. For full particulars address Box 219, Amer. Machinist.

WANTED.

The services of a first-class mechanic to take charge of a medium sized Agricultural Implement plant. A man who is thoroughly acquainted with modern methods in getting out wood and iron work and not afraid of work. All correspondence confidential. Address, giving experience, age and reference, W. 19. care Lord & Thomas, Chicago, Ill

Lathes

Lodge & Shipley Machine Tool Co.

Cincinnati, O.

GOOD BOOKS.

GAS, GASOLINE AND OIL ENGINES

By GARDINER D. HISCOX, M. E.

The only American book on an interesting subject. **279** large pages, 8vo, illustrated with 206 handsome engravings. **$2.50.**

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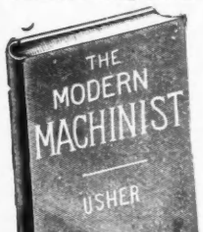

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It shows special ways of doing work better, quicker and cheaper than usual. It is full of pointers as to how work is done in the best American and European shops. It bristles with valuable wrinkles and helpful suggestions. It will benefit all, from apprentice to proprietor. Every machinist, at any age, should study its pages. It contains 222 illustrations, most of them directly contributed by eminent constructors. Every machinist needs it.

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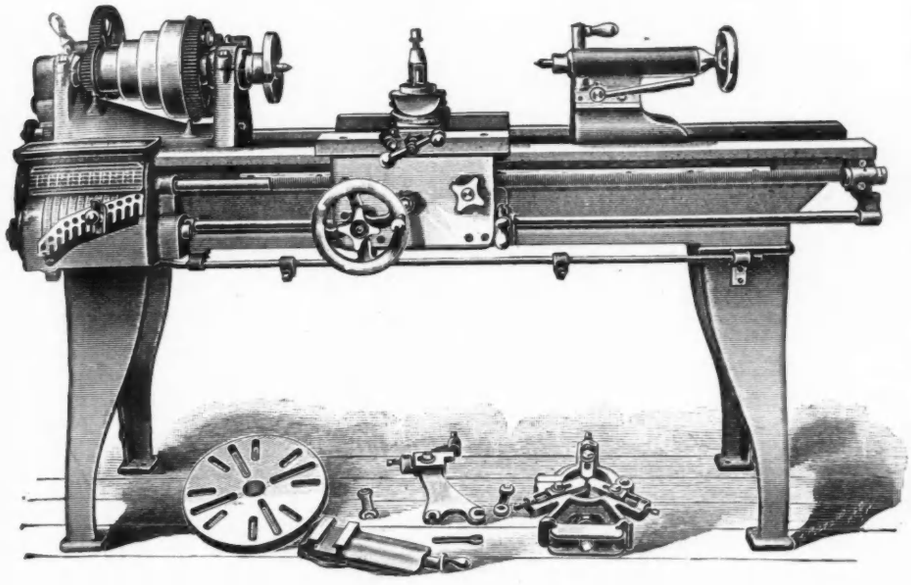
THIS LATHE COMBINES THE LATEST AND BEST IMPROVEMENTS.



14 in. x 6 ft. Hendey-Norton Lathe

With Improved Automatic Stop.

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AUTOMATIC STOP

It is durable, simple, indispensable. It will automatically stop the carriage in either direction. It is equally efficient whether feeding or thread-cutting, running up to a shoulder, boring to bottom of holes, or internal thread-cutting. No danger of spoiling either tool or work. It is a safeguard against accidents in either direction.

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The carriage reverses in apron; no slamming of countershaft. There is no comparison between this lathe and the old style or common lathe.

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It has all threads in daily use with simple movement of lever.

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Has all feeds in daily use with simple movement of lever. Send for Circular.

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(Continued from page 36.)

The plant of the South Bend (Ind.) Pulley Company has been destroyed by fire.

Work has been commenced on two additions to the Midvale Foundry, at Allentown, Pa.

The city of Cleveland, O., contemplates the installation of new boilers at the water works.

Graff & Co., stove founders, are contemplating the erection of a plant at Remington, Pa.

At Mansfield, Mass., F. B. Kingman is erecting a building to be used for manufacturing patterns.

Lennox & Briggs, Haverhill, Mass., are contemplating an addition to their factory in the rear of Duncan street.

Merchant & Co., of Philadelphia, Pa., have commenced the erection of a factory on Washington avenue, that city.

At Philadelphia, Pa., John O'Neill has begun the erection of a mill at the corner of Chadwick and McKean streets.

A new boiler and engine room is being erected at the plant of the Empire State Wine Company, at Penn Yan, Pa.

At Baltimore, Md., Mr. R. Weems Tansill is about to occupy a six-story building, in which the manufacture of cigars will be carried on.

The contract for the Boyd & Corey Company's new shoe factory, at Portland, Me., has been awarded. Work on the foundation has begun.

Willenbaugh & Co., of Brooklyn, N. Y., have purchased land at Allentown, Pa., for the erection of a silk mill, which, it is said, will employ 400 hands.

The city of Madison, Fla., will install machinery to run from ten to fifteen arc lights and 400 to 500 incandescent lights. William S. Jordan is interested.

A one-story brick addition, 30 x 82 feet, is to be built to the plant of the Pneumatic Despatch Tube Works, at Tioga and Agate streets, Philadelphia, Pa.

The planing mills of the Cordova Construction Company, at Cordova, Walker County, Ala., were burned to the ground recently. The loss is $20,000 with no insurance.

Articles of incorporation of the Smith Rotary Engine Company, of Louisville, Ky., have been filed. O. W. Smith, J. P. Duffy and W. M. Acuff are the incorporators.

Ground has been broken for the erection of a glass factory at Tiffin, O. The company is known as the Co-operative Glass Company, and the stockholders are Tiffin capitalists.

The Boston office of the T. & B. Tool Company, of Danbury, Conn., has been removed to 144 Pearl street, corner of Purchase street, and remains in charge of Alfred L. Lovejoy.

The hot mill building of the National Tin-Plate Company's new plant at Monessen, Pa., 100 x 500 feet, is almost completed. The tin mill building, 70 x 350 feet, is also under way.

The Boston office of the Pratt & Whitney Company, of Hartford, Conn., has been removed to 144 Pearl street, corner of Purchase street, and remains in charge of Alfred L. Lovejoy.

At Portland, Me., the Gold Saver & Mill Company has been organized, for the purpose of taking metal from ores. President, Edwin S. Brown, of Waltham, Mass.; treasurer, Herbert S. Baker, of Boston, Mass.

M. M. Schoetz, O. C. Little and W. C. Koehne, of Menasha, Wis., have filed articles of incorporation for the Little Pulley Coating Company, to manufacture a composition to keep belts from slipping. The capital stock is $10,000.

The Peck Bros. are making rapid headway with the work of reconstructing the Bullion-

ville (Nev.) mill. The old pans and settlers have been taken out, the building reroofed, and it will soon be in condition to receive the new machinery.

Operations have begun upon the addition to the mill of Walter Aiken at Franklin, N. H., the old Herrick Aiken mill being removed and the site used for the new wing. The structure will be 70 feet in length, and be built of brick.

J. G. Gay & Son, the Ottawa (Ill.) manufacturers, will soon begin the remodeling of their manufacturing plant, to meet the demands of their increasing business. An entire third story will be added to the main brick building, 80 x 140 feet.

Wilhelmi & Co., of New York City, has been incorporated to manufacture mathematical, chemical and mineral testing instruments. Messrs. E. A. Wilhelmi, of 163 Madison avenue; Joseph T. McLean and James H. Warner, of Staten Island, are among the directors.

The match factory on Erie street, Utica, N. Y., has been purchased by Charles W. Dickens. Mr. Dickens states that he will begin the work of repairing and refitting the plant soon, and expects to have the factory in shape to resume operations November 1st.

The distillery being built at Paris, Ky., by Walsh & Co. is to cover fifteen acres and contain twelve buildings, including five warehouses with a storage capacity og 62,000 barrels. The buildings are all fireproof, and built of iron, brick and stone, with cement floors.

The George M. Newhall Company, Brooklyn, N. Y., are now at work on the plans for a four-story fireproof boiler house and six-story fireproof melter house, to be erected on the south side of Pearl street, for Arbuckle Bros. The most modern machinery will be installed.

The Dempster Manufacturing Company, Des Moines, Ia., filed articles of incorporation recently. The company has been engaged in the machinery and mill supply business. The capital stock authorized is $100,000. The incorporators are A. H. Dempster, W. Z. Warner and J. H. Cochrane.

Plans have been submitted to the Building Inspection Bureau for the erection of two additional stories upon one of the buildings of Horner's Carpet Works, Lehigh avenue and Lawrence street, Philadelphia, Pa. The proposed addition will have a frontage of 60 feet and a depth of 501 feet.

The Thomas Driver & Sons' Manufacturing Company has leased the wood department of the Racine Boat Manufacturing Company, Racine, Wis. The company has decided to build a new shop. It will be in three departments, viz.: Boiler and engine room, dry kiln and manufacturing rooms.

Warren Webster & Co., Camden, N. J., have received the contract to install the Webster system of steam heating in connection with the new Hudson Building, New York City, and another to install the Webster system in connection with the works of the Rand Drill Company, Tarrytown, N. Y.

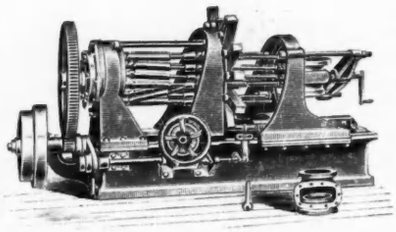
The Welded Barrel Company, Detroit, Mich., purposing to manufacture and sell metallic barrels, drums, tanks, etc., has been incorporated. The capital stock is $150,000. The stockholders are Charles L. Coffin and Cyrus E. Lothrop, both of Detroit, Mich., and Warren L. Beckwith, of Chicago.

The Cramer Dry-Plate Works, on Shenandoah avenue, between Eighteenth street and Lemp avenue, St. Louis, Mo., will be enlarged and an additional factory built. Permits were taken out and contracts let a few days ago by President Gustav Cramer for an addition, to cost $8,000, and a new building, to cost $12,000.

The Philadelphia Gas Improvement Company, of Philadelphia, Pa., are increasing

(Continued on page 39)

HORIZONTAL ADJUSTABLE 16-SPINDLE DRILLING MACHINE



For Drilling Holes ⅛" diameter sixteen at a time in valve flanges, or a less number of larger or smaller diameter grouped in circ es, squares and other forms.

Vertical machines of several sizes and styles of similar character, Gang Drills, etc.

Ask for the Machinist's Catalogue.

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Foot Power Screw Cutting, Automatic Cross Feed, 9 and 11" Swing.
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4. The Easiest Repaired, and all parts Interchangeable.
5. Every Valve Tested before leaving the factory.
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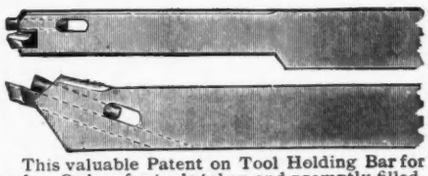

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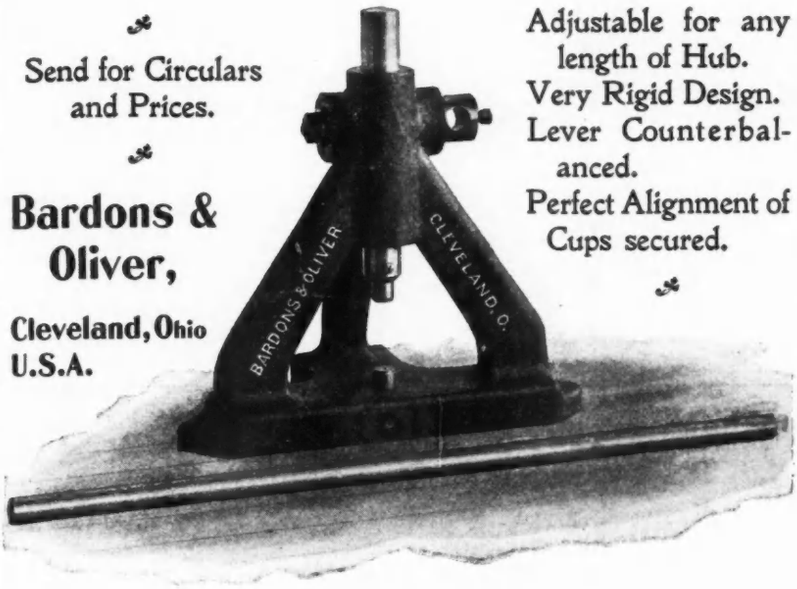

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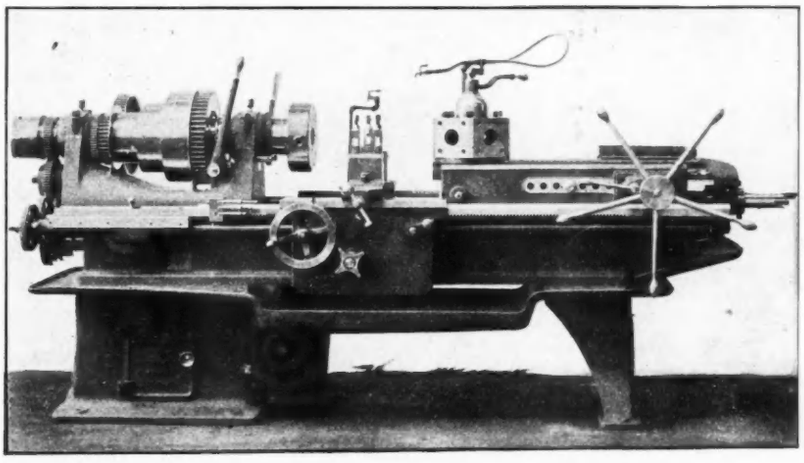

The latest Bullard Turret Machine has many improvements over others of any make. Money can be saved on anything, within the range of this machine, that must be bored, turned, faced or threaded. Let us send you a full description. Address Bullard Machine Tool Co., Bridgeport, Conn.

AGENTS: { CHAS. CHURCHILL & CO., LTD., London. / SCHUCHARDT & SCHUTTE, Berlin, Vienna and Brussels.

(*Continued from page 38.*)

their plant by erecting a new fireproof pipe shop, constructed entirely of iron. The building will have steel framework and a corrugated iron covering. The contract for erecting the building has been let to the Berlin Iron Bridge Company, of East Berlin, Conn.

A new corporation, known as the Union Tube & Iron Company of Howland Township, has just been incorporated at Warren, O. The capital stock is placed at $50,000. The company will manufacture and deal in iron and steel metal pipes, tubes, etc. The incorporators are C. D. Hine, W. DeP. Knowlton, C. F. Garrison, Warner Arms and F. M. Peet.

A company has been formed to build a steel and strip mill on the land of the Leechburg Land & Improvement Company, at the west end of the Leechburg Bridge, on the Westmoreland side. It is composed mostly of Leechburg (Pa.) capitalists, with the following officers: President, Captain A. Hicks; vice-president, J. W. Kirkpatrick; treasurer, J. L. Kirkpatrick.

Edward P. Baker and Duncan M. Service, of Philadelphia, Pa., and Wilson Waddingham, of Las Vegas, N. M., have incorporated the Callerine Manufacturing Company, with a capital stock of $50,000. The objects of incorporation are to carry on a general manufacturing, mining, chemical or trading business. The principal place of business is located at Las Vegas, N. M.

The Schenck Governor Company is the name of a new corporation organized at Meriden, Conn. The capital stock amounts to $30,000—Marcus P. Schenck, 150 shares; Martin B. Schenck, 100 shares; William A. Schenck, 50 shares. It will be the purpose of the new company to manufacture, purchase and sell water wheel governors, and all kinds of machinery tools and hardware.

The Riverside Iron Company, Wheeling, W. Va., have begun the foundation for a new coke manufacturing plant that will cost $50,000. The plant will be located at the company's works at Wheeling, and the coal for its operation will be hauled from the Fairmount region. It will make all the coke needed for two blast furnaces, and will utilize all by-products, such as gas, tar, etc.

The Somerset Chemical Works, Room 49, No. 52 Wall street, New York, N. Y.—August Heckscher, president; E. J. Ulman, treasurer, and Herman Prentzlien, secretary—are building a large chemical plant at Bridgewater Township (Bound Brook), Somerset County, N. J. There are to be fifteen buildings in all, of various sizes, four, three and two stories high, to be built of brick and stone, to have a complete power and electric plant.

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There are three sizes of Standard Catalogs, first authorized by the Master Car Builders' Association, 9" x 12", 6" x 9" and 3½" x 6". We recommend the 6" x 9" size for machinery catalogs. When they must be larger or smaller, one of the other standard sizes should be adopted if possible.

Kelly & Jones Company, of Greensburg, Pa., send us a catalog of cast-iron pipe fittings, including tees, elbows, Y branches, etc. The catalog is 5¾ x 9 inches.

The Newburgh Ice Machine & Engine Company, of Newburgh, N. Y., has forwarded to us a copy of their catalog of ice machinery, Corliss engines, etc. The catalog is standard size, 3½ x 6 inches.

The Keuffel & Esser Company, of New York, have issued a supplement to their catalog, which consists of changes of prices which have been made owing to the new tariff. It will be sent to those interested on application.

An engraving should intelligently depict the article it is supposed to represent, and in a pleasing, forceful manner that shall make business for its user. If it doesn't, it is shirking it's duty, and like any shiftless servant should be "fired."
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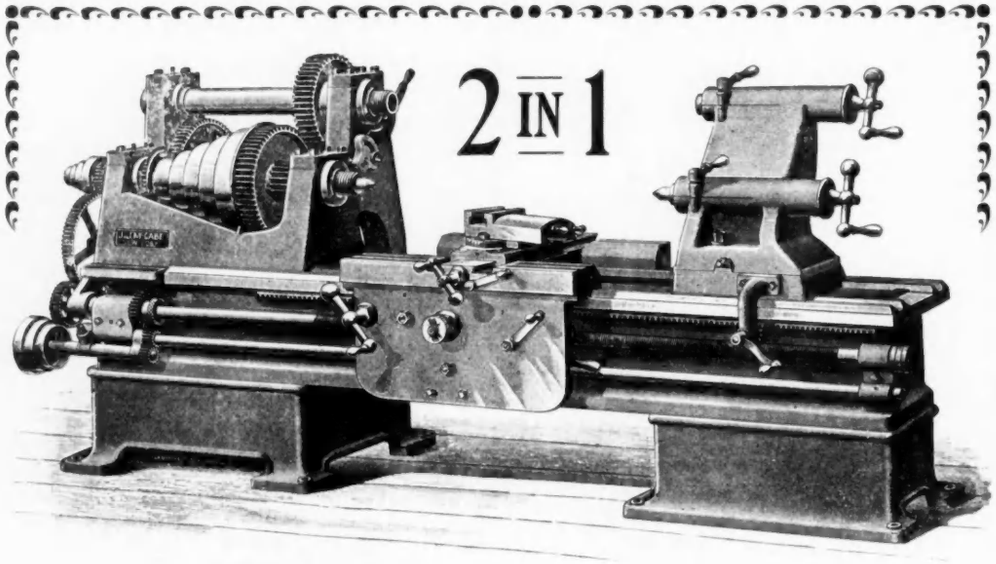

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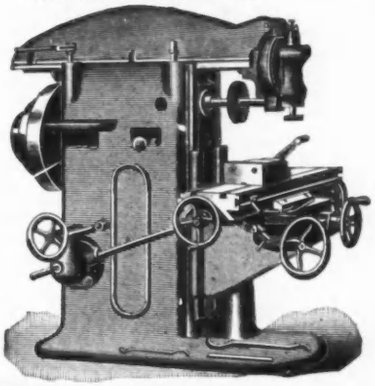

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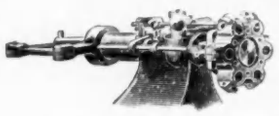

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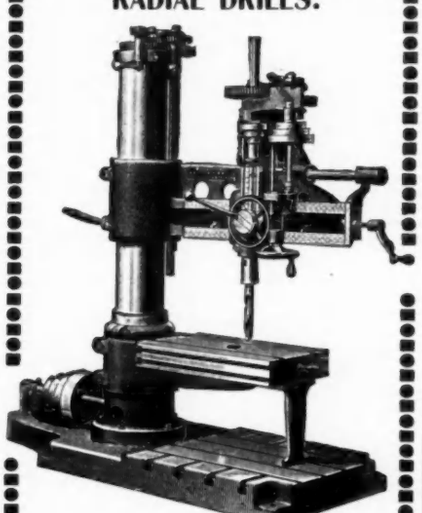

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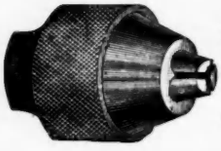

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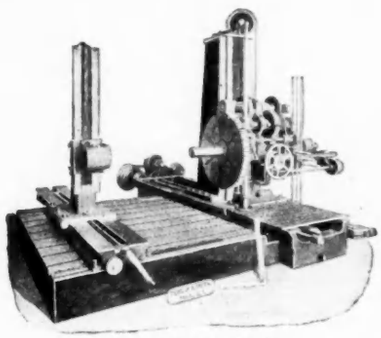
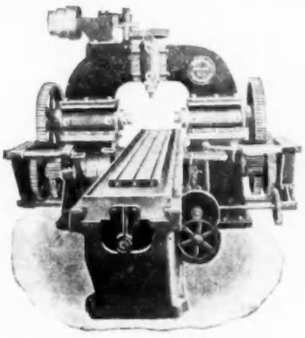
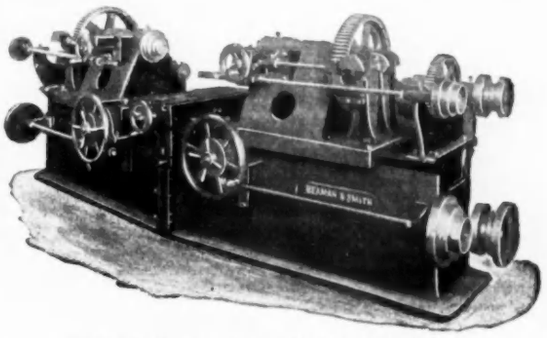


Horizontal Boring Machine.



Milling Machine.



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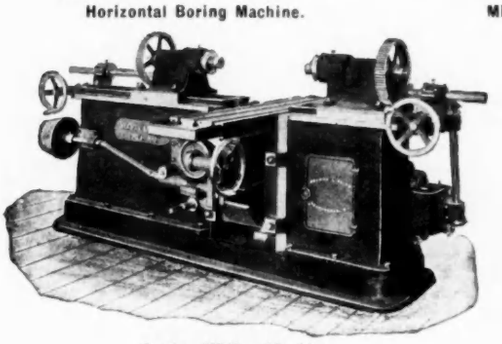
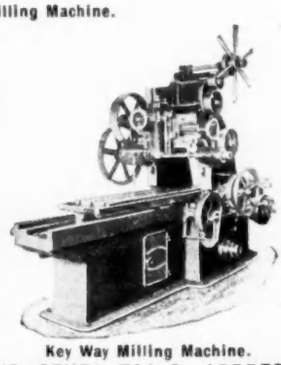
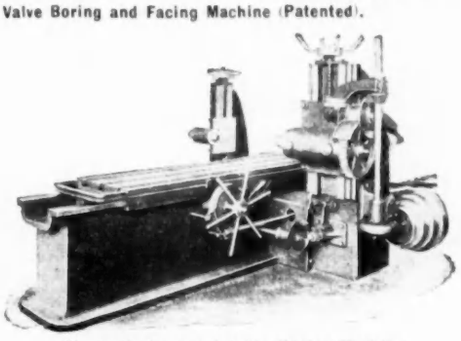


Duplex Milling Machine



Key Way Milling Machine.



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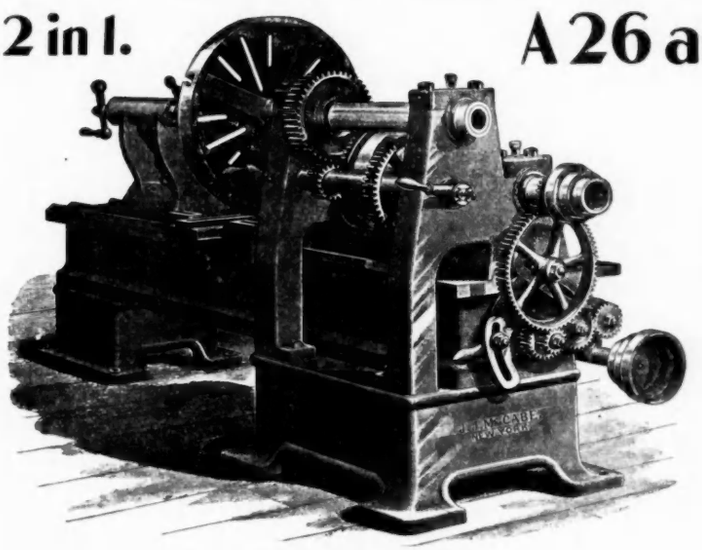

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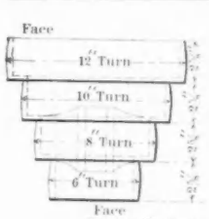

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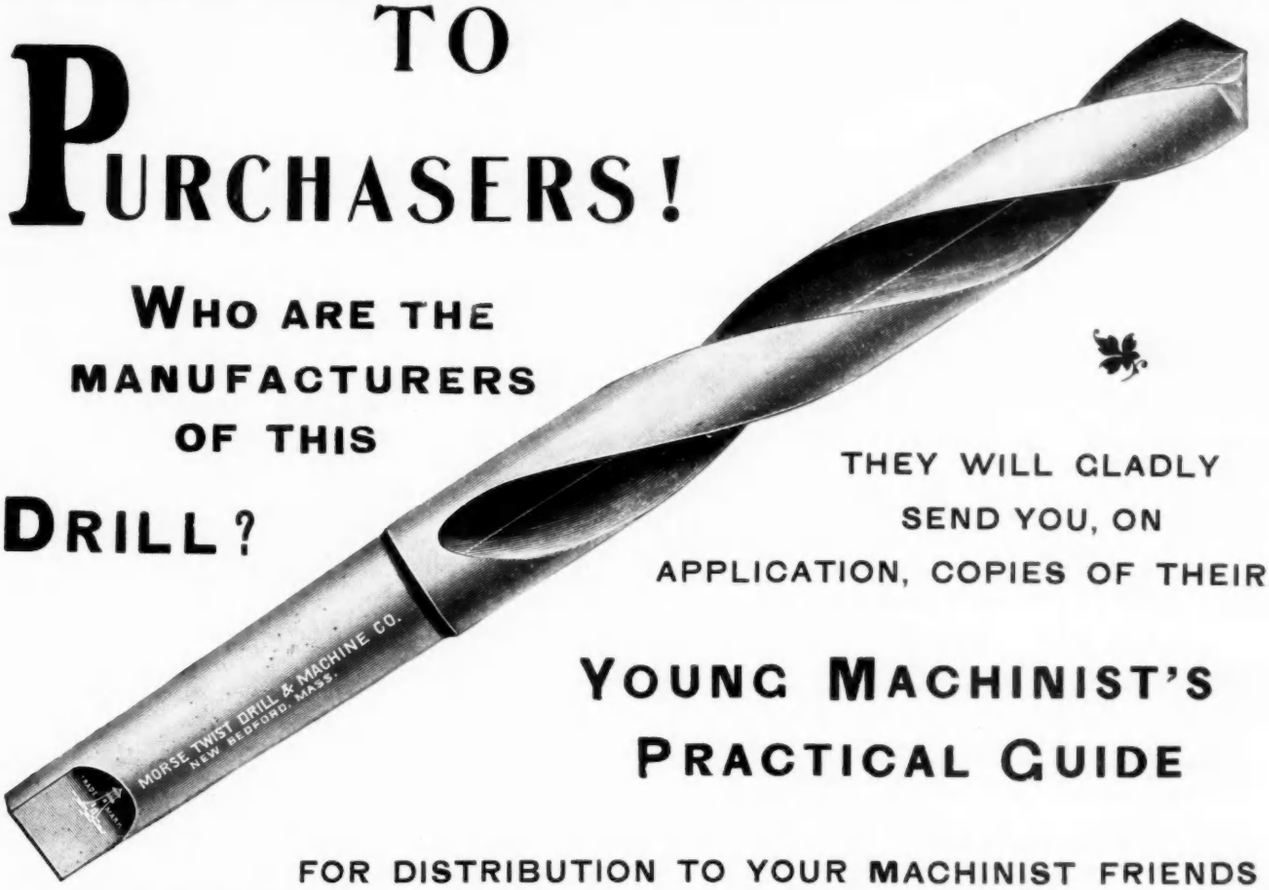

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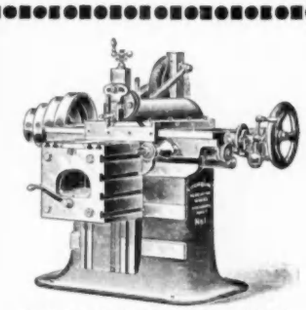

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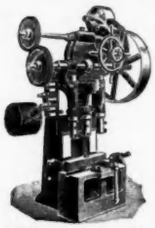

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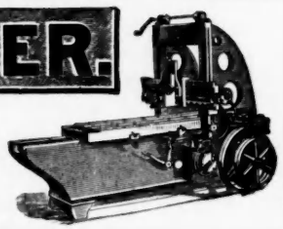

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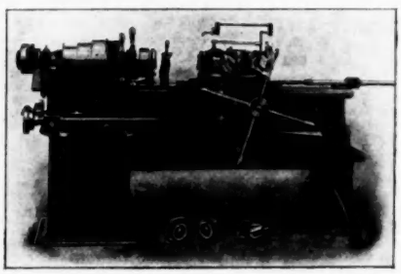

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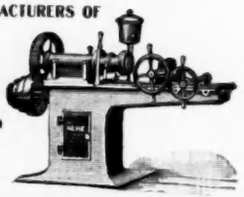

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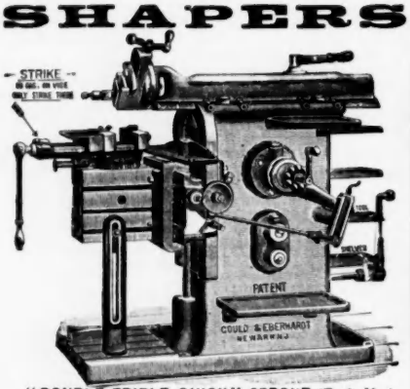

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